TETRA TECH

March 20, 2015

Mr. James Johnson
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

Subject: Data Deliverable Package 09
West Lake Landfill Site, Bridgeton, Missouri
CERCLIS ID: MOD079900932
EPA Region 7, START 4, Contract No. EP-S7-13-06, Task Order No. 0058
Task Monitor: James Johnson, On-Scene Coordinator

Dear Mr. Johnson:

Tetra Tech, Inc. is submitting the following analytical laboratory reports with associated data validation reports for sampling at locations off-site of the West Lake Landfill Site in Bridgeton, Missouri.

Sample Delivery Group	Analysis Type	Sample Collection Date
J10181	Gamma scan and gross alpha/beta	01/14/2015
J10273	Gamma scan and gross alpha/beta	01/21/2015
J10333	Alpha-emitting Ra and Isotopic U/Th	01/28/2015
J10418	Alpha-emitting Ra and Isotopic U/Th/ Gamma scan and gross alpha/beta	02/04/2015
J10545	Gamma scan and gross alpha/beta	02/11/2015
J10616	Gamma scan and gross alpha/beta	02/18/2015
J10707	Gamma scan and gross alpha/beta	02/25/2015
60186505	Volatile Organic Compounds	01/19/2015
60187573	Volatile Organic Compounds	02/04/2015
60188142	Volatile Organic Compounds	02/13/2015
P1500074	Hydrogen Sulfide	01/05/2015
P1500645	Hydrogen Sulfide	02/13/2015
P1500733	Hydrogen Sulfide	02/20/2015

If you have any questions or comments, please contact Rob Monnig at (816) 412-1775.

Sincerely,

for Dave Kinroth
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

cc: Debra Dorsey, START Project Officer (cover letter only)

415 Oak Street, Kansas City, MO 64106
Tel 816.412.1741 Fax 816.410.1748 www.tetratech.com

X9025.14.0058.000

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 11, 2015
Sample Delivery Group (SDG):	J10181
Sample Numbers:	WAA-01-AF-PS-20150114, WAA-02-AF-PS-20150114, WAA-03-AF-PS-20150114, WAA-04-AF-PS-20150114, WAA-05-AF-PS-20150114, and WAA-00-AF-FB-20150114
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

11 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10181 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded low alpha and beta activities and the field blank slightly higher beta activity, but no detectable alpha activity. The laboratory blank rarely yields detectable activities; no qualifications were applied for it. The other field samples yielded more than 10 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10181-2
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Rhonda Ridenhower

Authorized for release by:
1/29/2015 10:36:54 AM
Rhonda Ridenhower, Manager of Project Management
rhonda.ridenhower@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10181-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10181-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 01/19/2015; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 20.0 C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150114 (160-10181-1), WAA-02-AF-PS-20150114 (160-10181-2), WAA-03-AF-PS-20150114 (160-10181-3), WAA-04-AF-PS-20150114 (160-10181-4), WAA-05-AF-PS-20150114 (160-10181-5) and WAA-00-AF-FB-20150114 (160-10181-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared on 01/22/2015 and analyzed on 01/23/2015.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150114 (160-10181-1), WAA-02-AF-PS-20150114 (160-10181-2), WAA-03-AF-PS-20150114 (160-10181-3), WAA-04-AF-PS-20150114 (160-10181-4), WAA-05-AF-PS-20150114 (160-10181-5) and WAA-00-AF-FB-20150114 (160-10181-6) were

Job ID: 160-10181-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared and analyzed on 01/22/2015.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 1-19-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	**Analysis Turnaround Time**			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			Job / SDG No.:
Site: Bridgeton, MO	☐ 2 days			
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
WAA-01-AF-PS-20150114	1/14/15	11:25	Filter	Air	1			X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
WAA-02-AF-PS-20150114	1/14/15	10:15	Filter	Air	1			X	X	X	X	X	X	contingent upon TAR results
WAA-03-AF-PS-20150114	1/14/15	10:47	Filter	Air	1			X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150114	1/14/15	11:06	Filter	Air	1			X	X	X	X	X	X	
WAA-05-AF-PS-20150114	1/14/15	10:30	Filter	Air	1			X	X	X	X	X	X	
WAA-00-AF-FB-20150114	1/14/15	NA	Filter	Air	1			X	X	X	X	X	X	

160-10181 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1

☐Return to Client ☐Disposal by Lab ☐Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by: Timothy J Barbon	Tetra Tech	1/19/15 1100			1-19-15/1100
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10181-2

Login Number: 10181

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc. TestAmerica Job ID: 160-10181-2
Project/Site: West Lake Landfill - Filters

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10181-2

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10181-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10181-1	WAA-01-AF-PS-20150114	Filter	01/14/15 11:25	01/19/15 11:00
160-10181-2	WAA-02-AF-PS-20150114	Filter	01/14/15 10:15	01/19/15 11:00
160-10181-3	WAA-03-AF-PS-20150114	Filter	01/14/15 10:47	01/19/15 11:00
160-10181-4	WAA-04-AF-PS-20150114	Filter	01/14/15 11:06	01/19/15 11:00
160-10181-5	WAA-05-AF-PS-20150114	Filter	01/14/15 10:30	01/19/15 11:00
160-10181-6	WAA-00-AF-FB-20150114	Filter	01/14/15 00:00	01/19/15 11:00

Client Sample ID: WAA-01-AF-PS-20150114

Lab Sample ID: 160-10181-1
Matrix: Filter

Date Collected: 01/14/15 11:25
Date Received: 01/19/15 11:00

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.363	U	0.277	0.280	10.0	0.385	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1
Gross Beta	17.0		1.15	2.05	10.0	0.371	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.612	U	4.57	4.57	20.0	8.40	pCi/Sample	01/22/15 09:16	01/22/15 22:07	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Be-7	*99.2*		*34.8*	*36.2*		*25.4*	*pCi/Sample*	*01/22/15 09:16*	*01/22/15 22:07*	*1*

Client Sample ID: WAA-02-AF-PS-20150114

Lab Sample ID: 160-10181-2
Matrix: Filter

Date Collected: 01/14/15 10:15
Date Received: 01/19/15 11:00

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.373	J	0.253	0.256	10.0	0.329	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1
Gross Beta	15.7		1.12	1.93	10.0	0.423	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	2.01	U	3.23	3.24	20.0	5.52	pCi/Sample	01/22/15 09:16	01/22/15 22:11	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/22/15 09:16*	*01/22/15 22:11*	*1*

Client Sample ID: WAA-03-AF-PS-20150114

Lab Sample ID: 160-10181-3
Matrix: Filter

Date Collected: 01/14/15 10:47
Date Received: 01/19/15 11:00

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.424	J	0.284	0.288	10.0	0.384	pCi/Sample	01/22/15 09:13	01/23/15 09:35	1
Gross Beta	17.4		1.18	2.10	10.0	0.412	pCi/Sample	01/22/15 09:13	01/23/15 09:35	1

HVE 11 March 2015

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10181-2

Client Sample ID: WAA-03-AF-PS-20150114

Lab Sample ID: 160-10181-3
Matrix: Filter

Date Collected: 01/14/15 10:47
Date Received: 01/19/15 11:00

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0711	U	5.10	5.10	20.0	9.52	pCi/Sample	01/22/15 09:16	01/22/15 22:09	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Be-7	*111*		*48.2*	*49.5*		*47.8*	*pCi/Sample*	*01/22/15 09:16*	*01/22/15 22:09*	*1*

Client Sample ID: WAA-04-AF-PS-20150114

Lab Sample ID: 160-10181-4
Matrix: Filter

Date Collected: 01/14/15 11:06
Date Received: 01/19/15 11:00

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.770	J	0.325	0.336	10.0	0.316	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1
Gross Beta	18.3		1.19	2.18	10.0	0.354	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.72	U	5.86	5.87	20.0	10.5	pCi/Sample	01/22/15 09:16	01/22/15 22:07	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/22/15 09:16*	*01/22/15 22:07*	*1*

Client Sample ID: WAA-05-AF-PS-20150114

Lab Sample ID: 160-10181-5
Matrix: Filter

Date Collected: 01/14/15 10:30
Date Received: 01/19/15 11:00

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.530	J	0.266	0.273	10.0	0.272	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1
Gross Beta	14.3		1.04	1.77	10.0	0.333	pCi/Sample	01/22/15 09:13	01/23/15 08:02	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.765	U	7.07	7.07	20.0	13.0	pCi/Sample	01/22/15 09:16	01/22/15 22:08	1

AUG 11 Mar 15

Client Sample ID: WAA-05-AF-PS-20150114 — **Lab Sample ID: 160-10181-5**
Date Collected: 01/14/15 10:30 — Matrix: Filter
Date Received: 01/19/15 11:00

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	01/22/15 09:16	01/22/15 22:08	1

Client Sample ID: WAA-00-AF-FB-20150114 — **Lab Sample ID: 160-10181-6**
Date Collected: 01/14/15 00:00 — Matrix: Filter
Date Received: 01/19/15 11:00

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.190	U	0.189	0.190	10.0	0.281	pCi/Sample	01/22/15 09:13	01/23/15 08:03	1
Gross Beta	1.12	J	0.340	0.358	10.0	0.350	pCi/Sample	01/22/15 09:13	01/23/15 08:03	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.183	U	4.94	4.94	20.0	9.65	pCi/Sample	01/22/15 09:16	01/22/15 23:12	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	01/22/15 09:16	01/22/15 23:12	1

HUG
11 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10181-2

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-169724/1-A
Matrix: Filter
Analysis Batch: 170022

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 169724

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.4668		0.276	0.281	10.0	0.338	pCi/Sample	01/22/15 09:13	01/23/15 08:01	1
Gross Beta	0.6448		0.280	0.288	10.0	0.338	pCi/Sample	01/22/15 09:13	01/23/15 08:01	1

Lab Sample ID: LCS 160-169724/2-A
Matrix: Filter
Analysis Batch: 170022

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 169724

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.37	4.691		0.921	10.0	0.380	pCi/Samp	87	75 - 125

Lab Sample ID: LCSB 160-169724/3-A
Matrix: Filter
Analysis Batch: 170022

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 169724

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.9	17.74		2.13	10.0	0.357	pCi/Samp	99	75 - 125

Lab Sample ID: 160-10181-1 DU
Matrix: Filter
Analysis Batch: 170022

Client Sample ID: WAA-01-AF-PS-20150114
Prep Type: Total/NA
Prep Batch: 169724

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.363	U	0.6251		0.312	10.0	0.329	pCi/Samp	0.44	1
Gross Beta	17.0		17.99		2.16	10.0	0.423	pCi/Samp	0.23	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-169725/1-A
Matrix: Filter
Analysis Batch: 169802

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 169725

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-3.475	U	24.4	24.4	20.0	15.5	pCi/Sample	01/22/15 09:16	01/22/15 22:10	1

Other Detected Radionuclides	*MB Result*	*MB Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/22/15 09:16*	*01/22/15 22:10*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-169725/2-A
Matrix: Filter
Analysis Batch: 169804

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 169725

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	30280		3150		119	pCi/Samp	95	87 - 116
Cesium-137	11100	10290		1080	20.0	69.8	pCi/Samp	93	87 - 120
Cobalt-60	11800	11430		1160		35.5	pCi/Samp	97	87 - 115

Lab Sample ID: 160-10181-1 DU
Matrix: Filter
Analysis Batch: 169813

Client Sample ID: WAA-01-AF-PS-20150114
Prep Type: Total/NA
Prep Batch: 169725

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	0.612	U	-0.6624	U	6.58	20.0	11.8	pCi/Samp	0.11	1

Other Detected Radionuclides	*Sample Result*	*Sample Qual*	*DU Result*	*DU Qual*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*RER*	*RER Limit*
Be-7	*99.2*		*120.7*		*40.5*		*26.2*	*pCi/Samp*	*0.28*	*1*

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10181-2

Rad

Prep Batch: 169724

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10181-1	WAA-01-AF-PS-20150114	Total/NA	Filter	None	
160-10181-1 DU	WAA-01-AF-PS-20150114	Total/NA	Filter	None	
160-10181-2	WAA-02-AF-PS-20150114	Total/NA	Filter	None	
160-10181-3	WAA-03-AF-PS-20150114	Total/NA	Filter	None	
160-10181-4	WAA-04-AF-PS-20150114	Total/NA	Filter	None	
160-10181-5	WAA-05-AF-PS-20150114	Total/NA	Filter	None	
160-10181-6	WAA-00-AF-FB-20150114	Total/NA	Filter	None	
LCS 160-169724/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-169724/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-169724/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 169725

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10181-1	WAA-01-AF-PS-20150114	Total/NA	Filter	None	
160-10181-1 DU	WAA-01-AF-PS-20150114	Total/NA	Filter	None	
160-10181-2	WAA-02-AF-PS-20150114	Total/NA	Filter	None	
160-10181-3	WAA-03-AF-PS-20150114	Total/NA	Filter	None	
160-10181-4	WAA-04-AF-PS-20150114	Total/NA	Filter	None	
160-10181-5	WAA-05-AF-PS-20150114	Total/NA	Filter	None	
160-10181-6	WAA-00-AF-FB-20150114	Total/NA	Filter	None	
LCS 160-169725/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-169725/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 11, 2015
Sample Delivery Group (SDG):	J10273
Sample Numbers:	WAA-01-AF-PS-20150121, WAA-02-AF-PS-20150121, WAA-03-AF-PS-20150121, WAA-04-AF-PS-20150121, WAA-05-AF-PS-20150121, and WAA-00-AF-FB-20150121
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

11 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10273 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank a low beta activity. The other field samples yielded more than 5 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10273-2
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Authorized for release by:
1/30/2015 4:40:42 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10273-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10273-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 1/26/2015 11:30 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 18.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150121 (160-10273-1), WAA-02-AF-PS-20150121 (160-10273-2), WAA-03-AF-PS-20150121 (160-10273-3), WAA-04-AF-PS-20150121 (160-10273-4), WAA-05-AF-PS-20150121 (160-10273-5) and WAA-00-AF-FB-20150121 (160-10273-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared and analyzed on 01/29/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150121 (160-10273-1), WAA-02-AF-PS-20150121 (160-10273-2), WAA-03-AF-PS-20150121 (160-10273-3), WAA-04-AF-PS-20150121 (160-10273-4), WAA-05-AF-PS-20150121 (160-10273-5) and WAA-00-AF-FB-20150121 (160-10273-6) were

Job ID: 160-10273-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared and analyzed on 01/29/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 1-26-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	Analysis Turnaround Time			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			Job / SDG No.:
Site: Bridgeton, MO	☐ 2 days			
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
WAA-01-AF-PS-20150121	1/21/15	11:22	Filter	Air	1			X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
WAA-02-AF-PS-20150121	1/21/15	10:15	Filter	Air	1			X	X	X	X	X	X	contingent upon TAR results
WAA-03-AF-PS-20150121	1/21/15	10:53	Filter	Air	1			X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150121	1/21/15	11:08	Filter	Air	1			X	X	X	X	X	X	
WAA-05-AF-PS-20150121	1/21/15	10:31	Filter	Air	1			X	X	X	X	X	X	
WAA-00-AF-FB-20150121	1/21/15	NA	Filter	Air	1			X	X	X	X	X	X	

160-10273 Chain of Custody

Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

	Company:	Date/Time:		Company:	Date/Time:
Relinquished by: Tammy Bonham	Tetra Tech	1-26-15 11:30	Received by:	TA	1/27/15 1130
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

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11/30/2015

11 10 9 8 7 6 5 4 3 2 1

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10273-2

Login Number: 10273

List Source: TestAmerica St. Louis

List Number: 1

Creator: Daniels, Brian J

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10273-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10273-2

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10273-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10273-1	WAA-01-AF-PS-20150121	Filter	01/21/15 11:22	01/26/15 11:30
160-10273-2	WAA-02-AF-PS-20150121	Filter	01/21/15 10:15	01/26/15 11:30
160-10273-3	WAA-03-AF-PS-20150121	Filter	01/21/15 10:53	01/26/15 11:30
160-10273-4	WAA-04-AF-PS-20150121	Filter	01/21/15 11:08	01/26/15 11:30
160-10273-5	WAA-05-AF-PS-20150121	Filter	01/21/15 10:31	01/26/15 11:30
160-10273-6	WAA-00-AF-FB-20150121	Filter	01/21/15 00:00	01/26/15 11:30

Client Sample ID: WAA-01-AF-PS-20150121

Date Collected: 01/21/15 11:22
Date Received: 01/26/15 11:30

Lab Sample ID: 160-10273-1
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.503	U	0.305	0.310	10.0	0.392	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1
Gross Beta	18.1		1.19	2.17	10.0	0.361	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	2.53	U	4.66	4.67	20.0	8.05	pCi/Sample	01/29/15 11:46	01/29/15 17:10	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/29/15 11:46*	*01/29/15 17:10*	*1*

Client Sample ID: WAA-02-AF-PS-20150121

Date Collected: 01/21/15 10:15
Date Received: 01/26/15 11:30

Lab Sample ID: 160-10273-2
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.331	U	0.259	0.261	10.0	0.366	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1
Gross Beta	15.7		1.11	1.92	10.0	0.357	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.894	U	4.13	4.13	20.0	7.57	pCi/Sample	01/29/15 11:46	01/29/15 17:11	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/29/15 11:46*	*01/29/15 17:11*	*1*

Client Sample ID: WAA-03-AF-PS-20150121

Date Collected: 01/21/15 10:53
Date Received: 01/26/15 11:30

Lab Sample ID: 160-10273-3
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.332	U	0.270	0.273	10.0	0.385	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1
Gross Beta	17.7		1.17	2.12	10.0	0.371	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1

HUG 11 March 2015

Client Sample ID: WAA-03-AF-PS-20150121

Lab Sample ID: 160-10273-3
Matrix: Filter

Date Collected: 01/21/15 10:53
Date Received: 01/26/15 11:30

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.27	U	4.91	4.91	20.0	8.92	pCi/Sample	01/29/15 11:46	01/29/15 18:14	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/29/15 11:46*	*01/29/15 18:14*	*1*

Client Sample ID: WAA-04-AF-PS-20150121

Lab Sample ID: 160-10273-4
Matrix: Filter

Date Collected: 01/21/15 11:08
Date Received: 01/26/15 11:30

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.401	J	0.259	0.263	10.0	0.329	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1
Gross Beta	18.1		1.20	2.17	10.0	0.423	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-4.73	U	29.3	29.3	20.0	13.4	pCi/Sample	01/29/15 11:46	01/29/15 18:15	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/29/15 11:46*	*01/29/15 18:15*	*1*

Client Sample ID: WAA-05-AF-PS-20150121

Lab Sample ID: 160-10273-5
Matrix: Filter

Date Collected: 01/21/15 10:31
Date Received: 01/26/15 11:30

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.171	U	0.229	0.230	10.0	0.384	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1
Gross Beta	11.1		0.950	1.46	10.0	0.412	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.09	U	4.63	4.63	20.0	8.37	pCi/Sample	01/29/15 11:46	01/29/15 18:16	1

HVE 11 Mar 15

Client Sample ID: WAA-05-AF-PS-20150121

Lab Sample ID: 160-10273-5
Matrix: Filter

Date Collected: 01/21/15 10:31
Date Received: 01/26/15 11:30

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	01/29/15 11:46	01/29/15 18:16	1

Client Sample ID: WAA-00-AF-FB-20150121

Lab Sample ID: 160-10273-6
Matrix: Filter

Date Collected: 01/21/15 00:00
Date Received: 01/26/15 11:30

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.0504	U	0.160	0.160	10.0	0.316	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1
Gross Beta	1.49	J	0.381	0.409	10.0	0.354	pCi/Sample	01/29/15 11:43	01/29/15 12:21	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.508	U	4.74	4.74	20.0	8.87	pCi/Sample	01/29/15 11:46	01/29/15 19:17	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	01/29/15 11:46	01/29/15 19:17	1

HVG
11 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10273-2

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-171021/1-A
Matrix: Filter
Analysis Batch: 171129

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 171021

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.05930	U	0.190	0.190	10.0	0.366	pCi/Sample	01/29/15 11:43	01/29/15 12:20	1
Gross Beta	0.1990	U	0.223	0.224	10.0	0.364	pCi/Sample	01/29/15 11:43	01/29/15 12:20	1

Lab Sample ID: LCS 160-171021/2-A
Matrix: Filter
Analysis Batch: 171129

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 171021

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Gross Alpha			5.37	5.710		1.04	10.0	0.338	pCi/Samp	106	75 - 125		

Lab Sample ID: LCSB 160-171021/3-A
Matrix: Filter
Analysis Batch: 171129

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 171021

Analyte			Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Gross Beta			17.9	16.77		2.03	10.0	0.380	pCi/Samp	94	75 - 125		

Lab Sample ID: 160-10273-1 DU
Matrix: Filter
Analysis Batch: 171129

Client Sample ID: WAA-01-AF-PS-20150121
Prep Type: Total/NA
Prep Batch: 171021

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Gross Alpha	0.503			0.3599	U	0.268	10.0	0.366	pCi/Samp			0.25	1
Gross Beta	18.1			17.50		2.10	10.0	0.357	pCi/Samp			0.15	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-171091/1-A
Matrix: Filter
Analysis Batch: 171194

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 171091

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-3.700	U	28.0	28.0	20.0	15.8	pCi/Sample	01/29/15 11:46	01/29/15 17:08	1

Other Detected Radionuclides	*MB Result*	*MB Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*01/29/15 11:46*	*01/29/15 17:08*	*1*

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10273-2

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-171091/2-A
Matrix: Filter
Analysis Batch: 171193

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 171091

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	30690		3190		117	pCi/Samp	96	87 - 116
Cesium-137	11100	10650		1120	20.0	65.0	pCi/Samp	96	87 - 120
Cobalt-60	11700	11420		1160		31.3	pCi/Samp	97	87 - 115

Lab Sample ID: 160-10273-1 DU
Matrix: Filter
Analysis Batch: 171194

Client Sample ID: WAA-01-AF-PS-20150121
Prep Type: Total/NA
Prep Batch: 171091

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	2.53	U	0.3525	U	7.72	20.0	15.9	pCi/Samp	0.18	1

Other Detected Radionuclides	*Sample Result*	*Sample Qual*	*DU Result*	*DU Qual*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*RER*	*RER Limit*
Other Detected Radionuclide	*None*		*None*					*pCi/Samp*		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10273-2

Rad

Prep Batch: 171021

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10273-1	WAA-01-AF-PS-20150121	Total/NA	Filter	None	
160-10273-1 DU	WAA-01-AF-PS-20150121	Total/NA	Filter	None	
160-10273-2	WAA-02-AF-PS-20150121	Total/NA	Filter	None	
160-10273-3	WAA-03-AF-PS-20150121	Total/NA	Filter	None	
160-10273-4	WAA-04-AF-PS-20150121	Total/NA	Filter	None	
160-10273-5	WAA-05-AF-PS-20150121	Total/NA	Filter	None	
160-10273-6	WAA-00-AF-FB-20150121	Total/NA	Filter	None	
LCS 160-171021/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-171021/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-171021/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 171091

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10273-1	WAA-01-AF-PS-20150121	Total/NA	Filter	None	
160-10273-1 DU	WAA-01-AF-PS-20150121	Total/NA	Filter	None	
160-10273-2	WAA-02-AF-PS-20150121	Total/NA	Filter	None	
160-10273-3	WAA-03-AF-PS-20150121	Total/NA	Filter	None	
160-10273-4	WAA-04-AF-PS-20150121	Total/NA	Filter	None	
160-10273-5	WAA-05-AF-PS-20150121	Total/NA	Filter	None	
160-10273-6	WAA-00-AF-FB-20150121	Total/NA	Filter	None	
LCS 160-171091/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-171091/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 12, 2015
Sample Delivery Group (SDG):	J10333
Sample Numbers:	WAA-01-AF-PS-20150128, WAA-02-AF-PS-20150128, WAA-03-AF-PS-20150128, WAA-04-AF-PS-20150128, WAA-05-AF-PS-20150128, and WAA-00-AF-FB-20150128
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

12 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10333 included five (5) environmental air (filter) samples and one (1) QC sample (a field blank). Samples were analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and radium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Insufficient sample was available for MS/MSD analyses. Duplicate LCS analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded low activities for two (of three) thorium isotopes and the field blank yielded low activities for all of them, while neither yielded detectable activities for any of the three uranium isotopes. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the duplicate LCS analyses were within established control limits.

V. Surrogates

These radioanalytical methods use a "carrier" or "tracer", whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory's QC limits. No qualifications were applied.

VI. Comments

All detected results were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

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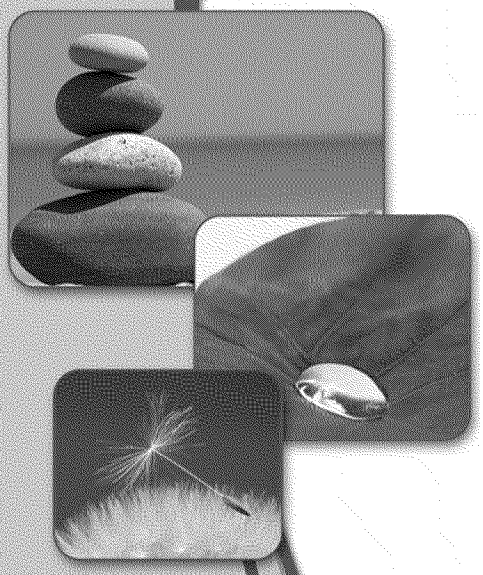

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10333-1
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Authorized for release by:
2/27/2015 4:33:12 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10333-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10333-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 2/2/2015 1:20 PM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 19.0° C.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-01-AF-PS-20150128 (160-10333-1), WAA-02-AF-PS-20150128 (160-10333-2), WAA-03-AF-PS-20150128 (160-10333-3), WAA-04-AF-PS-20150128 (160-10333-4), WAA-05-AF-PS-20150128 (160-10333-5) and WAA-00-AF-FB-20150128 (160-10333-6) were analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 02/11/2015 and analyzed on 02/18/2015 and 02/19/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 160-10333-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150128 (160-10333-1), WAA-02-AF-PS-20150128 (160-10333-2), WAA-03-AF-PS-20150128 (160-10333-3), WAA-04-AF-PS-20150128 (160-10333-4), WAA-05-AF-PS-20150128 (160-10333-5) and WAA-00-AF-FB-20150128 (160-10333-6) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 02/09/2015 and analyzed on 02/18/2015 and 02/19/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150128 (160-10333-1), WAA-02-AF-PS-20150128 (160-10333-2), WAA-03-AF-PS-20150128 (160-10333-3), WAA-04-AF-PS-20150128 (160-10333-4), WAA-05-AF-PS-20150128 (160-10333-5) and WAA-00-AF-FB-20150128 (160-10333-6) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 02/09/2015 and analyzed on 02/18/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 2-2-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	Analysis Turnaround Time			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			Job / SDG No.:
Site: Bridgeton, MO	☐ 2 days			
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
WAA-01-AF-PS-20150128	1/28/15	11:12	Filter	Air	1			X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
WAA-02-AF-PS-20150128	1/28/15	10:12	Filter	Air	1			X	X	X	X	X	X	contingent upon TAR results
WAA-03-AF-PS-20150128	1/28/15	10:40	Filter	Air	1			X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150128	1/28/15	10:58	Filter	Air	1			X	X	X	X	X	X	
WAA-05-AF-PS-20150128	1/28/15	10:25	Filter	Air	1			X	X	X	X	X	X	
WAA-00-AF-FB-20150128	1/28/15	NA	Filter	Air	1			X	X	X	X	X	X	

160-10333 Chain of Custody

Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by: Terry Pomeau	Tetra Tech	1/28/15 1320			22-K / 1320
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10333-1

Login Number: 10333

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10333-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10333-1

Method	Method Description	Protocol	Laboratory
9315	Total Apha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10333-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10333-1	WAA-01-AF-PS-20150128	Filter	01/28/15 11:12	02/02/15 13:20
160-10333-2	WAA-02-AF-PS-20150128	Filter	01/28/15 10:12	02/02/15 13:20
160-10333-3	WAA-03-AF-PS-20150128	Filter	01/28/15 10:40	02/02/15 13:20
160-10333-4	WAA-04-AF-PS-20150128	Filter	01/28/15 10:58	02/02/15 13:20
160-10333-5	WAA-05-AF-PS-20150128	Filter	01/28/15 10:25	02/02/15 13:20
160-10333-6	WAA-00-AF-FB-20150128	Filter	01/28/15 00:00	02/02/15 13:20

Client Sample ID: WAA-01-AF-PS-20150128

Date Collected: 01/28/15 11:12
Date Received: 02/02/15 13:20

Lab Sample ID: 160-10333-1
Matrix: Filter

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.00669	U	0.388	0.388	1.00	0.741	pCi/Sample	02/11/15 14:07	02/18/15 16:40	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110	02/11/15 14:07	02/18/15 16:40	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.187	U	0.179	0.179	1.00	0.275	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-230	0.325	J	0.169	0.171	1.00	0.155	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-232	0.0383	U	0.0542	0.0543	1.00	0.0575	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	88.9		30 - 110	02/09/15 13:41	02/18/15 14:00	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0722	U	0.0824	0.0826	1.00	0.111	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	0.0648	U	0.0894	0.0895	1.00	0.139	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	0.101	J	0.0900	0.0904	1.00	0.0604	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	85.0		30 - 110	02/09/15 13:41	02/18/15 20:10	1

Client Sample ID: WAA-02-AF-PS-20150128

Date Collected: 01/28/15 10:12
Date Received: 02/02/15 13:20

Lab Sample ID: 160-10333-2
Matrix: Filter

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.266	U	0.345	0.346	1.00	0.576	pCi/Sample	02/11/15 14:07	02/19/15 10:19	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	105		40 - 110	02/11/15 14:07	02/19/15 10:19	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.187	U	0.168	0.169	1.00	0.253	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-230	0.490	J	0.192	0.197	1.00	0.0566	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-232	0.0751	J	0.0751	0.0753	1.00	0.0563	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1

HUE 12 March 2015

Client Sample ID: WAA-02-AF-PS-20150128

Lab Sample ID: 160-10333-2
Matrix: Filter

Date Collected: 01/28/15 10:12
Date Received: 02/02/15 13:20

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	89.8		30 - 110	02/09/15 13:41	02/18/15 14:00	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0970	J	0.0867	0.0871	1.00	0.0582	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	0.0141	U J	0.0523	0.0523	1.00	0.133	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	0.0968	J	0.0866	0.0869	1.00	0.0581	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	92.2		30 - 110	02/09/15 13:41	02/18/15 20:10	1

Client Sample ID: WAA-03-AF-PS-20150128

Lab Sample ID: 160-10333-3
Matrix: Filter

Date Collected: 01/28/15 10:40
Date Received: 02/02/15 13:20

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.0330	U	0.296	0.296	1.00	0.580	pCi/Sample	02/11/15 14:07	02/19/15 10:19	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110	02/11/15 14:07	02/19/15 10:19	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.164	U	0.149	0.150	1.00	0.222	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-230	0.210	J	0.131	0.132	1.00	0.132	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-232	0.0533	J	0.0615	0.0617	1.00	0.0533	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	98.9		30 - 110	02/09/15 13:41	02/18/15 14:00	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0210	U	0.0553	0.0553	1.00	0.119	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	0.0355	U	0.0662	0.0663	1.00	0.124	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	0.0360	U	0.0509	0.0510	1.00	0.0540	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	95.6		30 - 110	02/09/15 13:41	02/18/15 20:10	1

HUE 12 Mar 15

Client Sample ID: WAA-04-AF-PS-20150128

Date Collected: 01/28/15 10:58
Date Received: 02/02/15 13:20

Lab Sample ID: 160-10333-4
Matrix: Filter

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.219	U	0.393	0.393	1.00	0.677	pCi/Sample	02/11/15 14:07	02/19/15 10:19	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110	02/11/15 14:07	02/19/15 10:19	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.194	U	0.162	0.163	1.00	0.234	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-230	0.193	J	0.127	0.128	1.00	0.123	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-232	-0.0172	U	0.0673	0.0673	1.00	0.182	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	92.5		30 - 110	02/09/15 13:41	02/18/15 14:00	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.138	U	0.117	0.118	1.00	0.152	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	0.0137	U	0.0507	0.0508	1.00	0.129	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	-0.00783	U	0.0157	0.0157	1.00	0.104	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	90.0		30 - 110	02/09/15 13:41	02/18/15 20:10	1

Client Sample ID: WAA-05-AF-PS-20150128

Date Collected: 01/28/15 10:25
Date Received: 02/02/15 13:20

Lab Sample ID: 160-10333-5
Matrix: Filter

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.532	U	0.376	0.379	1.00	0.552	pCi/Sample	02/11/15 14:07	02/19/15 10:19	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110	02/11/15 14:07	02/19/15 10:19	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.206	U	0.155	0.156	1.00	0.207	pCi/Sample	02/09/15 13:41	02/19/15 20:52	1
Thorium-230	0.317	J	0.155	0.157	1.00	0.0568	pCi/Sample	02/09/15 13:41	02/19/15 20:52	1
Thorium-232	0.0565	J	0.0653	0.0655	1.00	0.0565	pCi/Sample	02/09/15 13:41	02/19/15 20:52	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	93.0		30 - 110	02/09/15 13:41	02/19/15 20:52	1

NFG 12 Mar 15

Client Sample ID: WAA-05-AF-PS-20150128

Lab Sample ID: 160-10333-5
Matrix: Filter

Date Collected: 01/28/15 10:25
Date Received: 02/02/15 13:20

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0372	U	0.0526	0.0527	1.00	0.0558	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	-0.0193	U	0.0273	0.0273	1.00	0.152	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	0.0479	U	0.0661	0.0662	1.00	0.103	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*92.0*		*30 - 110*	*02/09/15 13:41*	*02/18/15 20:10*	*1*

Client Sample ID: WAA-00-AF-FB-20150128

Lab Sample ID: 160-10333-6
Matrix: Filter

Date Collected: 01/28/15 00:00
Date Received: 02/02/15 13:20

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.0607	U	0.281	0.281	1.00	0.525	pCi/Sample	02/11/15 14:07	02/19/15 10:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*104*		*40 - 110*	*02/11/15 14:07*	*02/19/15 10:19*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.275	J	0.178	0.179	1.00	0.228	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-230	0.703	J	0.232	0.240	1.00	0.104	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-232	0.0751	J	0.0751	0.0753	1.00	0.0563	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*93.4*		*30 - 110*	*02/09/15 13:41*	*02/18/15 14:00*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0863	U	0.0856	0.0860	1.00	0.104	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	0.000	U	0.0195	0.0195	1.00	0.0703	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	0.0485	U	0.0669	0.0671	1.00	0.104	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*91.3*		*30 - 110*	*02/09/15 13:41*	*02/18/15 20:10*	*1*

1+U ∈
12 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10333-1

Method: 9315 - Total Apha Radium (GFPC)

Lab Sample ID: MB 160-173444/1-A
Matrix: Filter
Analysis Batch: 174681

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 173444

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.4832	U	0.438	0.441	1.00	0.688	pCi/Sample	02/11/15 14:07	02/18/15 16:25	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.5*		*40 - 110*	*02/11/15 14:07*	*02/18/15 16:25*	*1*

Lab Sample ID: LCS 160-173444/2-A
Matrix: Filter
Analysis Batch: 174681

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 173444

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Total Alpha Radium			45.0	48.42		5.05	1.00	0.925	pCi/Samp	108	65 - 150		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*101*		*40 - 110*

Lab Sample ID: LCSD 160-173444/3-A
Matrix: Filter
Analysis Batch: 174681

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 173444

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Total Alpha Radium			45.0	46.14		4.85	1.00	0.711	pCi/Samp	103	65 - 150	0.23	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*99.1*		*40 - 110*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-172903/1-A
Matrix: Filter
Analysis Batch: 174545

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 172903

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.5188		0.223	0.227	1.00	0.211	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-230	0.6105		0.224	0.230	1.00	0.130	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1
Thorium-232	0.004114	U	0.0555	0.0555	1.00	0.146	pCi/Sample	02/09/15 13:41	02/18/15 14:00	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*87.8*		*30 - 110*	*02/09/15 13:41*	*02/18/15 14:00*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-172903/2-A
Matrix: Filter
Analysis Batch: 174546

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 172903

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Thorium-230			16.1	16.31		1.77	1.00	0.0580	pCi/Samp	102	81 - 118		

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Thorium-229	*88.7*		*30 - 110*

Lab Sample ID: LCSD 160-172903/3-A
Matrix: Filter
Analysis Batch: 174547

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 172903

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230			16.1	18.25		1.97	1.00	0.115	pCi/Samp	114	81 - 118	0.52	1

Tracer	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Thorium-229	*82.3*		*30 - 110*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-172904/1-A
Matrix: Filter
Analysis Batch: 174534

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 172904

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.1150	U	0.110	0.110	1.00	0.148	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-235/236	0.02489	U	0.0498	0.0498	1.00	0.0747	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1
Uranium-238	0.01497	U	0.0634	0.0634	1.00	0.147	pCi/Sample	02/09/15 13:41	02/18/15 20:10	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*86.8*		*30 - 110*	*02/09/15 13:41*	*02/18/15 20:10*	*1*

Lab Sample ID: LCS 160-172904/2-A
Matrix: Filter
Analysis Batch: 174535

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 172904

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Uranium-233/234			25.5	25.48		2.61	1.00	0.213	pCi/Samp	100	84 - 120		
Uranium-238			26.0	28.88		2.90	1.00	0.162	pCi/Samp	111	82 - 122		

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Uranium-232	*80.6*		*30 - 110*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-172904/3-A
Matrix: Filter
Analysis Batch: 174536

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 172904

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234			25.5	24.89		2.54	1.00	0.138	pCi/Samp	98	84 - 120	0.11	1
Uranium-238			26.0	26.55		2.68	1.00	0.0626	pCi/Samp	102	82 - 122	0.42	1

Tracer	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Uranium-232	*81.5*		*30 - 110*

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10333-1

Rad

Prep Batch: 172903

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10333-1	WAA-01-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-2	WAA-02-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-3	WAA-03-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-4	WAA-04-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-5	WAA-05-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-6	WAA-00-AF-FB-20150128	Total/NA	Filter	ExtChrom	
LCS 160-172903/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-172903/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-172903/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 172904

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10333-1	WAA-01-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-2	WAA-02-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-3	WAA-03-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-4	WAA-04-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-5	WAA-05-AF-PS-20150128	Total/NA	Filter	ExtChrom	
160-10333-6	WAA-00-AF-FB-20150128	Total/NA	Filter	ExtChrom	
LCS 160-172904/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-172904/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-172904/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 173444

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10333-1	WAA-01-AF-PS-20150128	Total/NA	Filter	DPS-0	
160-10333-2	WAA-02-AF-PS-20150128	Total/NA	Filter	DPS-0	
160-10333-3	WAA-03-AF-PS-20150128	Total/NA	Filter	DPS-0	
160-10333-4	WAA-04-AF-PS-20150128	Total/NA	Filter	DPS-0	
160-10333-5	WAA-05-AF-PS-20150128	Total/NA	Filter	DPS-0	
160-10333-6	WAA-00-AF-FB-20150128	Total/NA	Filter	DPS-0	
LCS 160-173444/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-173444/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-173444/1-A	Method Blank	Total/NA	Filter	DPS-0	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10333-1

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
160-10333-1	WAA-01-AF-PS-20150128	104
160-10333-2	WAA-02-AF-PS-20150128	105
160-10333-3	WAA-03-AF-PS-20150128	104
160-10333-4	WAA-04-AF-PS-20150128	104
160-10333-5	WAA-05-AF-PS-20150128	102
160-10333-6	WAA-00-AF-FB-20150128	104
LCS 160-173444/2-A	Lab Control Sample	101
LCSD 160-173444/3-A	Lab Control Sample Dup	99.1
MB 160-173444/1-A	Method Blank	98.5

Tracer/Carrier Legend

Ba = Ba Carrier

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Th-229
Lab Sample ID	Client Sample ID	(30-110)
160-10333-1	WAA-01-AF-PS-20150128	88.9
160-10333-2	WAA-02-AF-PS-20150128	89.8
160-10333-3	WAA-03-AF-PS-20150128	98.9
160-10333-4	WAA-04-AF-PS-20150128	92.5
160-10333-5	WAA-05-AF-PS-20150128	93.0
160-10333-6	WAA-00-AF-FB-20150128	93.4
LCS 160-172903/2-A	Lab Control Sample	88.7
LCSD 160-172903/3-A	Lab Control Sample Dup	82.3
MB 160-172903/1-A	Method Blank	87.8

Tracer/Carrier Legend

Th-229 = Thorium-229

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		U-232
Lab Sample ID	Client Sample ID	(30-110)
160-10333-1	WAA-01-AF-PS-20150128	85.0
160-10333-2	WAA-02-AF-PS-20150128	92.2
160-10333-3	WAA-03-AF-PS-20150128	95.6
160-10333-4	WAA-04-AF-PS-20150128	90.0
160-10333-5	WAA-05-AF-PS-20150128	92.0
160-10333-6	WAA-00-AF-FB-20150128	91.3
LCS 160-172904/2-A	Lab Control Sample	80.6
LCSD 160-172904/3-A	Lab Control Sample Dup	81.5
MB 160-172904/1-A	Method Blank	86.8

Tracer/Carrier Legend

U-232 = Uranium-232

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 12, 2015
Sample Delivery Group (SDG):	J10418
Sample Numbers:	WAA-01-AF-PS-20150204, WAA-02-AF-PS-20150204, WAA-03-AF-PS-20150204, WAA-04-AF-PS-20150204, WAA-05-AF-PS-20150204, and WAA-00-AF-FB-20150204
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

12 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10418 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. They were also analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and radium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blanks yielded no detectable activities and the field blank a low beta activity plus low activities for two (of three) thorium isotopes and one (of three) uranium isotopes. The other field samples yielded more than 5 times the field blank beta activity and either no detectable thorium and uranium activities or activities similar to the field blank. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Some of these radioanalytical methods use a "carrier" or "tracer", whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory's QC limits. No qualifications were applied.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10418-1
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Authorized for release by:
3/10/2015 3:59:56 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10418-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10418-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 2/9/2015 11:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 20.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150204 (160-10418-1), WAA-02-AF-PS-20150204 (160-10418-2), WAA-03-AF-PS-20150204 (160-10418-3), WAA-04-AF-PS-20150204 (160-10418-4), WAA-05-AF-PS-20150204 (160-10418-5) and WAA-00-AF-FB-20150204 (160-10418-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared and analyzed on 02/10/2015.

No additional analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-01-AF-PS-20150204 (160-10418-1), WAA-02-AF-PS-20150204 (160-10418-2), WAA-03-AF-PS-20150204 (160-10418-3), WAA-04-AF-PS-20150204 (160-10418-4), WAA-05-AF-PS-20150204 (160-10418-5) and WAA-00-AF-FB-20150204 (160-10418-6) were

Job ID: 160-10418-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 02/20/2015 and analyzed on 02/24/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150204 (160-10418-1), WAA-02-AF-PS-20150204 (160-10418-2), WAA-03-AF-PS-20150204 (160-10418-3), WAA-04-AF-PS-20150204 (160-10418-4), WAA-05-AF-PS-20150204 (160-10418-5) and WAA-00-AF-FB-20150204 (160-10418-6) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 02/17/2015 and analyzed on 03/01/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150204 (160-10418-1), WAA-02-AF-PS-20150204 (160-10418-2), WAA-03-AF-PS-20150204 (160-10418-3), WAA-04-AF-PS-20150204 (160-10418-4), WAA-05-AF-PS-20150204 (160-10418-5) and WAA-00-AF-FB-20150204 (160-10418-6) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 02/17/2015 and analyzed on 03/01/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150204 (160-10418-1), WAA-02-AF-PS-20150204 (160-10418-2), WAA-03-AF-PS-20150204 (160-10418-3), WAA-04-AF-PS-20150204 (160-10418-4), WAA-05-AF-PS-20150204 (160-10418-5) and WAA-00-AF-FB-20150204 (160-10418-6) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared and analyzed on 02/10/2015.

No additional analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 2-9-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	**Analysis Turnaround Time**			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			
Site: Bridgeton, MO	☐ 2 days			Job / SDG No.:
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
WAA-01-AF-PS-20150204	2/4/15	11:19	Filter	Air	1			X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
WAA-02-AF-PS-20150204	2/4/15	10:15	Filter	Air	1			X	X	X	X	X	X	contingent upon TAR results
WAA-03-AF-PS-20150204	2/4/15	10:47	Filter	Air	1			X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150204	2/4/15	11:03	Filter	Air	1			X	X	X	X	X	X	
WAA-05-AF-PS-20150204	2/4/15	10:33	Filter	Air	1			X	X	X	X	X	X	
WAA-00-AF-FB-20150204	2/4/15	NA	Filter	Air	1			X	X	X	X	X	X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 m

☐Return to Client ☐Disposal by Lab ☐Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Tony Barbour	Tetra Tech	2/9/15 1110	Gil Clarke	TA STL	2.9.15 1110
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

160-10418 Chain of Custody

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WLLFOIA4312 - 015 - 0156262

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10418-1

Login Number: 10418

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc. TestAmerica Job ID: 160-10418-1
Project/Site: West Lake Landfill - Filters

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
9315	Total Apha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10418-1	WAA-01-AF-PS-20150204	Filter	02/04/15 11:19	02/09/15 11:10
160-10418-2	WAA-02-AF-PS-20150204	Filter	02/04/15 10:15	02/09/15 11:10
160-10418-3	WAA-03-AF-PS-20150204	Filter	02/04/15 10:47	02/09/15 11:10
160-10418-4	WAA-04-AF-PS-20150204	Filter	02/04/15 11:03	02/09/15 11:10
160-10418-5	WAA-05-AF-PS-20150204	Filter	02/04/15 10:33	02/09/15 11:10
160-10418-6	WAA-00-AF-FB-20150204	Filter	02/04/15 00:00	02/09/15 11:10

Client Sample ID: WAA-01-AF-PS-20150204
Date Collected: 02/04/15 11:19
Date Received: 02/09/15 11:10

Lab Sample ID: 160-10418-1
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.446	J	0.262	0.267	10.0	0.311	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1
Gross Beta	12.8		1.00	1.63	10.0	0.383	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.167	U	0.365	0.366	1.00	0.645	pCi/Sample	02/20/15 09:26	02/24/15 17:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*103*		*40 - 110*	*02/20/15 09:26*	*02/24/15 17:48*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.355	J	0.200	0.202	1.00	0.250	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.312	J	0.159	0.161	1.00	0.135	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.0636	U	0.0965	0.0966	1.00	0.167	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*92.1*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.116	U	0.122	0.123	1.00	0.185	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	0.0476	U	0.0674	0.0675	1.00	0.0715	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.0255	U	0.0734	0.0735	1.00	0.154	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*90.5*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.733	U	5.07	5.07	20.0	9.47	pCi/Sample	02/10/15 08:36	02/10/15 19:18	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/10/15 08:36*	*02/10/15 19:18*	*1*

HUE 12 March 2015

Client Sample ID: WAA-02-AF-PS-20150204
Date Collected: 02/04/15 10:15
Date Received: 02/09/15 11:10

Lab Sample ID: 160-10418-2
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.205	U	0.181	0.182	10.0	0.250	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1
Gross Beta	10.6		0.905	1.40	10.0	0.343	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.626	U	0.463	0.467	1.00	0.701	pCi/Sample	02/20/15 09:26	02/24/15 17:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*103*		*40 - 110*	*02/20/15 09:26*	*02/24/15 17:48*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.430	J	0.208	0.211	1.00	0.232	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.397	J	0.181	0.184	1.00	0.150	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.103	J	0.0919	0.0923	1.00	0.102	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*93.9*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0711	U	0.0891	0.0893	1.00	0.140	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	0.00393	U	0.0548	0.0548	1.00	0.155	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.0867	U	0.0861	0.0864	1.00	0.105	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*91.3*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.353	U	6.09	6.09	20.0	11.1	pCi/Sample	02/10/15 08:36	02/10/15 19:18	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/10/15 08:36*	*02/10/15 19:18*	*1*

HWE 12 Mar 15

Client Sample ID: WAA-03-AF-PS-20150204
Date Collected: 02/04/15 10:47
Date Received: 02/09/15 11:10

Lab Sample ID: 160-10418-3
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.368	J	0.241	0.244	10.0	0.296	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1
Gross Beta	13.1		1.01	1.65	10.0	0.348	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.00620	U	0.311	0.311	1.00	0.602	pCi/Sample	02/20/15 09:26	02/24/15 17:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*108*		*40 - 110*	*02/20/15 09:26*	*02/24/15 17:48*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.453	J	0.203	0.206	1.00	0.197	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.371	J	0.166	0.169	1.00	0.0559	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.0772	U	0.0857	0.0859	1.00	0.122	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*92.6*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	-0.0178	U	0.0696	0.0696	1.00	0.188	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	0.0141	U	0.0523	0.0523	1.00	0.133	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.0968	J	0.0866	0.0870	1.00	0.0581	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*91.2*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-2.64	U	18.4	18.4	20.0	15.3	pCi/Sample	02/10/15 08:36	02/10/15 19:20	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Be-7	*112*		*51.3*	*52.5*		*48.9*	*pCi/Sample*	*02/10/15 08:36*	*02/10/15 19:20*	*1*

AVG 12 Mar 15

Client Sample ID: WAA-04-AF-PS-20150204
Date Collected: 02/04/15 11:03
Date Received: 02/09/15 11:10

Lab Sample ID: 160-10418-4
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.269	U	0.219	0.221	10.0	0.304	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1
Gross Beta	12.1		0.977	1.56	10.0	0.391	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.341	U	0.339	0.341	1.00	0.536	pCi/Sample	02/20/15 09:26	02/24/15 17:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*103*		*40 - 110*	*02/20/15 09:26*	*02/24/15 17:48*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.229	U	0.179	0.180	1.00	0.258	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.300	J	0.150	0.152	1.00	0.0998	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.0355	U	0.0665	0.0666	1.00	0.125	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*95.2*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.136	U	0.116	0.116	1.00	0.149	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	-0.00962	U	0.0192	0.0193	1.00	0.128	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.114	U	0.100	0.101	1.00	0.122	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*89.7*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.849	U	4.97	4.97	20.0	9.16	pCi/Sample	02/10/15 08:36	02/10/15 19:20	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/10/15 08:36*	*02/10/15 19:20*	*1*

HUE 12 Mar 15

Client Sample ID: WAA-05-AF-PS-20150204
Date Collected: 02/04/15 10:33
Date Received: 02/09/15 11:10

Lab Sample ID: 160-10418-5
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.555	J	0.287	0.294	10.0	0.328	pCi/Sample	02/10/15 08:33	02/10/15 12:10	1
Gross Beta	10.0		0.884	1.33	10.0	0.384	pCi/Sample	02/10/15 08:33	02/10/15 12:10	1

Method: 9315 - Total Apha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.279	U	0.396	0.397	1.00	0.669	pCi/Sample	02/20/15 09:26	02/24/15 17:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*105*		*40 - 110*	*02/20/15 09:26*	*02/24/15 17:48*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.412	J	0.190	0.193	1.00	0.183	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.306	J	0.152	0.154	1.00	0.100	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.0795	U	0.0827	0.0830	1.00	0.109	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*92.8*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0442	U	0.0822	0.0823	1.00	0.153	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	0.000	U	0.0197	0.0197	1.00	0.0708	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.0978	U	0.0954	0.0957	1.00	0.124	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*90.3*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.108	U	5.92	5.92	20.0	13.3	pCi/Sample	02/10/15 08:36	02/10/15 19:21	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Be-7	*108*		*43.1*	*44.5*		*34.2*	*pCi/Sample*	*02/10/15 08:36*	*02/10/15 19:21*	*1*

HVE 12 Mar 15

Client Sample ID: WAA-00-AF-FB-20150204
Date Collected: 02/04/15 00:00
Date Received: 02/09/15 11:10

Lab Sample ID: 160-10418-6
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.118	U	0.202	0.202	10.0	0.356	pCi/Sample	02/10/15 08:33	02/10/15 12:10	1
Gross Beta	1.50	J	0.397	0.424	10.0	0.407	pCi/Sample	02/10/15 08:33	02/10/15 12:10	1

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.186	U	0.281	0.282	1.00	0.482	pCi/Sample	02/20/15 09:26	02/24/15 17:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*106*		*40 - 110*	*02/20/15 09:26*	*02/24/15 17:48*	*1*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.314	J	0.188	0.190	1.00	0.236	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.356	J	0.168	0.170	1.00	0.122	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.0331	U	0.0753	0.0753	1.00	0.149	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*92.0*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.144	J	0.109	0.109	1.00	0.105	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	-0.00986	U	0.0197	0.0197	1.00	0.131	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.0380	U	0.0537	0.0538	1.00	0.0569	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*88.6*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	1.84	U	4.61	4.62	20.0	8.16	pCi/Sample	02/10/15 08:36	02/10/15 20:21	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/10/15 08:36*	*02/10/15 20:21*	*1*

ATUE 12 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-173023/1-A
Matrix: Filter
Analysis Batch: 173049

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 173023

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.3496	U	0.262	0.265	10.0	0.353	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1
Gross Beta	0.2898	U	0.245	0.247	10.0	0.378	pCi/Sample	02/10/15 08:33	02/10/15 12:08	1

Lab Sample ID: LCS 160-173023/2-A
Matrix: Filter
Analysis Batch: 173049

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 173023

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.37	5.158		0.972	10.0	0.329	pCi/Samp	96	75 - 125

Lab Sample ID: LCSB 160-173023/3-A
Matrix: Filter
Analysis Batch: 173049

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 173023

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.9	14.93		1.84	10.0	0.295	pCi/Samp	84	75 - 125

Lab Sample ID: 160-10418-1 DU
Matrix: Filter
Analysis Batch: 173100

Client Sample ID: WAA-01-AF-PS-20150204
Prep Type: Total/NA
Prep Batch: 173023

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.446		0.3396		0.246	10.0	0.328	pCi/Samp	0.21	1
Gross Beta	12.8		14.23		1.77	10.0	0.384	pCi/Samp	0.42	1

Method: 9315 - Total Apha Radium (GFPC)

Lab Sample ID: MB 160-174943/1-A
Matrix: Filter
Analysis Batch: 177517

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 174943

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.09938	U	0.136	0.136	1.00	0.228	pCi/Sample	02/20/15 09:26	03/05/15 17:58	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*02/20/15 09:26*	*03/05/15 17:58*	*1*

Method: 9315 - Total Apha Radium (GFPC) (Continued)

Lab Sample ID: LCS 160-174943/2-A
Matrix: Filter
Analysis Batch: 175571

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 174943

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Total Alpha Radium			45.0	42.32		4.46	1.00	0.657	pCi/Samp	94	65 - 150		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*98.8*		*40 - 110*

Lab Sample ID: LCSD 160-174943/3-A
Matrix: Filter
Analysis Batch: 175571

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 174943

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Total Alpha Radium			45.0	46.63		4.87	1.00	0.743	pCi/Samp	104	65 - 150	0.46	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*96.5*		*40 - 110*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-174391/1-A
Matrix: Filter
Analysis Batch: 176462

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 174391

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.2416	U	0.182	0.183	1.00	0.254	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-230	0.04982	U	0.0961	0.0962	1.00	0.179	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1
Thorium-232	0.04951	U	0.0830	0.0831	1.00	0.149	pCi/Sample	02/17/15 08:50	03/01/15 21:32	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Thorium-229	*91.1*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:32*	*1*

Lab Sample ID: LCS 160-174391/2-A
Matrix: Filter
Analysis Batch: 176463

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 174391

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Thorium-230			16.1	16.10		1.77	1.00	0.132	pCi/Samp	100	81 - 118		

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Thorium-229	*87.5*		*30 - 110*

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-174391/3-A
Matrix: Filter
Analysis Batch: 176464

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 174391

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230			16.1	17.03		1.83	1.00	0.156	pCi/Samp	106	81 - 118	0.26	1

Tracer	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Thorium-229	*88.2*		*30 - 110*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-174392/1-A
Matrix: Filter
Analysis Batch: 176471

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 174392

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	-0.01108	U	0.0923	0.0923	1.00	0.216	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-235/236	0.01379	U	0.0512	0.0512	1.00	0.131	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1
Uranium-238	0.05370	U	0.112	0.112	1.00	0.208	pCi/Sample	02/17/15 08:50	03/01/15 21:31	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*89.2*		*30 - 110*	*02/17/15 08:50*	*03/01/15 21:31*	*1*

Lab Sample ID: LCS 160-174392/2-A
Matrix: Filter
Analysis Batch: 176472

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 174392

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Uranium-233/234			25.5	24.81		2.52	1.00	0.196	pCi/Samp	97	84 - 120		
Uranium-238			26.0	25.75		2.60	1.00	0.174	pCi/Samp	99	82 - 122		

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Uranium-232	*82.3*		*30 - 110*

Lab Sample ID: LCSD 160-174392/3-A
Matrix: Filter
Analysis Batch: 176473

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 174392

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234			25.5	24.94		2.55	1.00	0.230	pCi/Samp	98	84 - 120	0.02	1
Uranium-238			26.0	26.66		2.69	1.00	0.202	pCi/Samp	102	82 - 122	0.17	1

Tracer	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Uranium-232	*86.3*		*30 - 110*

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-173024/1-A
Matrix: Filter
Analysis Batch: 173091

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 173024

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.0000	U	2.91	2.91	20.0	9.47	pCi/Sample	02/10/15 08:36	02/10/15 19:17	1

Other Detected Radionuclides	*MB Result*	*MB Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/10/15 08:36*	*02/10/15 19:17*	*1*

Lab Sample ID: LCS 160-173024/2-A
Matrix: Filter
Analysis Batch: 173090

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 173024

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	30370		3160		119	pCi/Samp	95	87 - 116
Cesium-137	11100	10710		1120	20.0	65.3	pCi/Samp	97	87 - 120
Cobalt-60	11700	11090		1120		54.7	pCi/Samp	95	87 - 115

Lab Sample ID: 160-10418-1 DU
Matrix: Filter
Analysis Batch: 173091

Client Sample ID: WAA-01-AF-PS-20150204
Prep Type: Total/NA
Prep Batch: 173024

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	0.733	U	-1.587	U	5.19	20.0	9.19	pCi/Samp	0.23	1

Other Detected Radionuclides	*Sample Result*	*Sample Qual*	*DU Result*	*DU Qual*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*RER*	*RER Limit*
Other Detected Radionuclide	*None*		*None*					*pCi/Samp*		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Rad

Prep Batch: 173023

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10418-1	WAA-01-AF-PS-20150204	Total/NA	Filter	None	
160-10418-1 DU	WAA-01-AF-PS-20150204	Total/NA	Filter	None	
160-10418-2	WAA-02-AF-PS-20150204	Total/NA	Filter	None	
160-10418-3	WAA-03-AF-PS-20150204	Total/NA	Filter	None	
160-10418-4	WAA-04-AF-PS-20150204	Total/NA	Filter	None	
160-10418-5	WAA-05-AF-PS-20150204	Total/NA	Filter	None	
160-10418-6	WAA-00-AF-FB-20150204	Total/NA	Filter	None	
LCS 160-173023/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-173023/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-173023/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 173024

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10418-1	WAA-01-AF-PS-20150204	Total/NA	Filter	None	
160-10418-1 DU	WAA-01-AF-PS-20150204	Total/NA	Filter	None	
160-10418-2	WAA-02-AF-PS-20150204	Total/NA	Filter	None	
160-10418-3	WAA-03-AF-PS-20150204	Total/NA	Filter	None	
160-10418-4	WAA-04-AF-PS-20150204	Total/NA	Filter	None	
160-10418-5	WAA-05-AF-PS-20150204	Total/NA	Filter	None	
160-10418-6	WAA-00-AF-FB-20150204	Total/NA	Filter	None	
LCS 160-173024/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-173024/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 174391

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10418-1	WAA-01-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-2	WAA-02-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-3	WAA-03-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-4	WAA-04-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-5	WAA-05-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-6	WAA-00-AF-FB-20150204	Total/NA	Filter	ExtChrom	
LCS 160-174391/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-174391/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-174391/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 174392

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10418-1	WAA-01-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-2	WAA-02-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-3	WAA-03-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-4	WAA-04-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-5	WAA-05-AF-PS-20150204	Total/NA	Filter	ExtChrom	
160-10418-6	WAA-00-AF-FB-20150204	Total/NA	Filter	ExtChrom	
LCS 160-174392/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-174392/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-174392/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 174943

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10418-1	WAA-01-AF-PS-20150204	Total/NA	Filter	DPS-0	
160-10418-2	WAA-02-AF-PS-20150204	Total/NA	Filter	DPS-0	

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Rad (Continued)

Prep Batch: 174943 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10418-3	WAA-03-AF-PS-20150204	Total/NA	Filter	DPS-0	
160-10418-4	WAA-04-AF-PS-20150204	Total/NA	Filter	DPS-0	
160-10418-5	WAA-05-AF-PS-20150204	Total/NA	Filter	DPS-0	
160-10418-6	WAA-00-AF-FB-20150204	Total/NA	Filter	DPS-0	
LCS 160-174943/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-174943/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-174943/1-A	Method Blank	Total/NA	Filter	DPS-0	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10418-1

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
160-10418-1	WAA-01-AF-PS-20150204	103
160-10418-2	WAA-02-AF-PS-20150204	103
160-10418-3	WAA-03-AF-PS-20150204	108
160-10418-4	WAA-04-AF-PS-20150204	103
160-10418-5	WAA-05-AF-PS-20150204	105
160-10418-6	WAA-00-AF-FB-20150204	106
LCS 160-174943/2-A	Lab Control Sample	98.8
LCSD 160-174943/3-A	Lab Control Sample Dup	96.5
MB 160-174943/1-A	Method Blank	96.8

Tracer/Carrier Legend

Ba = Ba Carrier

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Th-229
Lab Sample ID	Client Sample ID	(30-110)
160-10418-1	WAA-01-AF-PS-20150204	92.1
160-10418-2	WAA-02-AF-PS-20150204	93.9
160-10418-3	WAA-03-AF-PS-20150204	92.6
160-10418-4	WAA-04-AF-PS-20150204	95.2
160-10418-5	WAA-05-AF-PS-20150204	92.8
160-10418-6	WAA-00-AF-FB-20150204	92.0
LCS 160-174391/2-A	Lab Control Sample	87.5
LCSD 160-174391/3-A	Lab Control Sample Dup	88.2
MB 160-174391/1-A	Method Blank	91.1

Tracer/Carrier Legend

Th-229 = Thorium-229

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		U-232
Lab Sample ID	Client Sample ID	(30-110)
160-10418-1	WAA-01-AF-PS-20150204	90.5
160-10418-2	WAA-02-AF-PS-20150204	91.3
160-10418-3	WAA-03-AF-PS-20150204	91.2
160-10418-4	WAA-04-AF-PS-20150204	89.7
160-10418-5	WAA-05-AF-PS-20150204	90.3
160-10418-6	WAA-00-AF-FB-20150204	88.6
LCS 160-174392/2-A	Lab Control Sample	82.3
LCSD 160-174392/3-A	Lab Control Sample Dup	86.3
MB 160-174392/1-A	Method Blank	89.2

Tracer/Carrier Legend

U-232 = Uranium-232

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 11, 2015
Sample Delivery Group (SDG):	J10545
Sample Numbers:	WAA-01-AF-PS-20150211, WAA-02-AF-PS-20150211, WAA-03-AF-PS-20150211, WAA-04-AF-PS-20150211, WAA-05-AF-PS-20150211, and WAA-00-AF-FB-20150211
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

11 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10545 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank a low beta activity. The other field samples yielded more than 10 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10545-2
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:
2/26/2015 3:58:01 PM
Elizabeth Hoerchler, Project Mgmt. Assistant
elizabeth.hoerchler@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10545-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10545-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 02/19/2015; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 18.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150211 (160-10545-1), WAA-02-AF-PS-20150211 (160-10545-2), WAA-03-AF-PS-20150211 (160-10545-3), WAA-04-AF-PS-20150211 (160-10545-4), WAA-05-AF-PS-20150211 (160-10545-5) and WAA-00-AF-FB-20150211 (160-10545-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared on 02/23/2015 and analyzed on 02/24/2015.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150211 (160-10545-1), WAA-02-AF-PS-20150211 (160-10545-2), WAA-03-AF-PS-20150211 (160-10545-3), WAA-04-AF-PS-20150211 (160-10545-4), WAA-05-AF-PS-20150211 (160-10545-5) and WAA-00-AF-FB-20150211 (160-10545-6) were

Job ID: 160-10545-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared and analyzed on 02/23/2015.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 2-16-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	**Analysis Turnaround Time**			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			Job / SDG No.:
Site: Bridgeton, MO	☐ 2 days			
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
WAA-01-AF-PS-20150211	2/11/15	11:14	Filter	Air	1			X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
WAA-02-AF-PS-20150211	2/11/15	10:14	Filter	Air	1			X	X	X	X	X	X	contingent upon TAR results
WAA-03-AF-PS-20150211	2/11/15	10:44	Filter	Air	1			X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150211	2/11/15	10:58	Filter	Air	1			X	X	X	X	X	X	
WAA-05-AF-PS-20150211	2/11/15	10:30	Filter	Air	1			X	X	X	X	X	X	
WAA-00-AF-FB-20150211	2/11/15	NA	Filter	Air	1			X	X	X	X	X	X	

160-10545 Chain of Custody

Preservation Used: 1= Ice, 2= HCl, 3= H_2SO_4, 4=HNO_3, 5=NaOH, 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by: Emily Bordeaux	Tetra Tech	2/19/15 0930		TA	2/19/15 0930
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

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2/26/2015

WLLFOIA4312 - 015 - 0156288

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10545-2

Login Number: 10545

List Source: TestAmerica St. Louis

List Number: 1

Creator: Daniels, Brian J

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc. TestAmerica Job ID: 160-10545-2
Project/Site: West Lake Landfill - Filters

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-2

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10545-1	WAA-01-AF-PS-20150211	Filter	02/11/15 11:14	02/19/15 09:30
160-10545-2	WAA-02-AF-PS-20150211	Filter	02/11/15 10:14	02/19/15 09:30
160-10545-3	WAA-03-AF-PS-20150211	Filter	02/11/15 10:44	02/19/15 09:30
160-10545-4	WAA-04-AF-PS-20150211	Filter	02/11/15 10:58	02/19/15 09:30
160-10545-5	WAA-05-AF-PS-20150211	Filter	02/11/15 10:30	02/19/15 09:30
160-10545-6	WAA-00-AF-FB-20150211	Filter	02/11/15 00:00	02/19/15 09:30

Client Sample ID: WAA-01-AF-PS-20150211

Date Collected: 02/11/15 11:14
Date Received: 02/19/15 09:30

Lab Sample ID: 160-10545-1
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.830	J	0.340	0.353	10.0	0.322	pCi/Sample	02/23/15 15:25	02/24/15 07:15	1
Gross Beta	21.8		1.33	2.55	10.0	0.427	pCi/Sample	02/23/15 15:25	02/24/15 07:15	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.000	U	5.03	5.03	20.0	9.47	pCi/Sample	02/23/15 15:31	02/23/15 18:28	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/23/15 15:31*	*02/23/15 18:28*	*1*

Client Sample ID: WAA-02-AF-PS-20150211

Date Collected: 02/11/15 10:14
Date Received: 02/19/15 09:30

Lab Sample ID: 160-10545-2
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.616	J	0.320	0.328	10.0	0.380	pCi/Sample	02/23/15 15:25	02/24/15 07:15	1
Gross Beta	17.4		1.16	2.09	10.0	0.418	pCi/Sample	02/23/15 15:25	02/24/15 07:15	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	1.58	U	6.48	6.48	20.0	11.8	pCi/Sample	02/23/15 15:31	02/23/15 18:28	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/23/15 15:31*	*02/23/15 18:28*	*1*

Client Sample ID: WAA-03-AF-PS-20150211

Date Collected: 02/11/15 10:44
Date Received: 02/19/15 09:30

Lab Sample ID: 160-10545-3
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.535	J	0.303	0.309	10.0	0.375	pCi/Sample	02/23/15 15:25	02/24/15 07:16	1
Gross Beta	20.7		1.28	2.43	10.0	0.417	pCi/Sample	02/23/15 15:25	02/24/15 07:16	1

AVE 11 March 2015

Client Sample ID: WAA-03-AF-PS-20150211

Date Collected: 02/11/15 10:44
Date Received: 02/19/15 09:30

Lab Sample ID: 160-10545-3
Matrix: Filter

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.71	U	5.75	5.75	20.0	10.2	pCi/Sample	02/23/15 15:31	02/23/15 19:37	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/23/15 15:31*	*02/23/15 19:37*	*1*

Client Sample ID: WAA-04-AF-PS-20150211

Date Collected: 02/11/15 10:58
Date Received: 02/19/15 09:30

Lab Sample ID: 160-10545-4
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.597	J	0.316	0.323	10.0	0.374	pCi/Sample	02/23/15 15:25	02/24/15 07:16	1
Gross Beta	18.3		1.20	2.19	10.0	0.423	pCi/Sample	02/23/15 15:25	02/24/15 07:16	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.718	U	6.71	6.71	20.0	12.4	pCi/Sample	02/23/15 15:31	02/23/15 19:36	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/23/15 15:31*	*02/23/15 19:36*	*1*

Client Sample ID: WAA-05-AF-PS-20150211

Date Collected: 02/11/15 10:30
Date Received: 02/19/15 09:30

Lab Sample ID: 160-10545-5
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.666	J	0.319	0.328	10.0	0.350	pCi/Sample	02/23/15 15:25	02/24/15 08:28	1
Gross Beta	16.1		1.14	1.97	10.0	0.440	pCi/Sample	02/23/15 15:25	02/24/15 08:28	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	9.92	J	4.14	4.27	20.0	3.18	pCi/Sample	02/23/15 15:31	02/23/15 19:36	1

HVE 11 Mar 15

Client Sample ID: WAA-05-AF-PS-20150211

Lab Sample ID: 160-10545-5
Matrix: Filter

Date Collected: 02/11/15 10:30
Date Received: 02/19/15 09:30

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Be-7	103		45.6	46.8		40.9	pCi/Sample	02/23/15 15:31	02/23/15 19:36	1

Client Sample ID: WAA-00-AF-FB-20150211

Lab Sample ID: 160-10545-6
Matrix: Filter

Date Collected: 02/11/15 00:00
Date Received: 02/19/15 09:30

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.0819	U	0.174	0.174	10.0	0.323	pCi/Sample	02/23/15 15:25	02/24/15 08:28	1
Gross Beta	1.67	J	0.406	0.439	10.0	0.370	pCi/Sample	02/23/15 15:25	02/24/15 08:28	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-4.84	U	21.6	21.6	20.0	13.9	pCi/Sample	02/23/15 15:31	02/23/15 19:39	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	02/23/15 15:31	02/23/15 19:39	1

HUG

11 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-2

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-175372/1-A
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 175372

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.07847	U	0.189	0.189	10.0	0.356	pCi/Sample	02/23/15 15:25	02/24/15 07:14	1
Gross Beta	0.1418	U	0.255	0.255	10.0	0.439	pCi/Sample	02/23/15 15:25	02/24/15 07:14	1

Lab Sample ID: LCS 160-175372/2-A
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 175372

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.37	5.097		0.971	10.0	0.350	pCi/Samp	95	75 - 125

Lab Sample ID: LCSB 160-175372/3-A
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 175372

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.8	18.24		2.18	10.0	0.370	pCi/Samp	102	75 - 125

Lab Sample ID: 160-10545-1 DU
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: WAA-01-AF-PS-20150211
Prep Type: Total/NA
Prep Batch: 175372

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.830		0.4884		0.295	10.0	0.356	pCi/Samp	0.53	1
Gross Beta	21.8		21.20		2.48	10.0	0.439	pCi/Samp	0.12	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-175374/1-A
Matrix: Filter
Analysis Batch: 175292

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 175374

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.549	U	5.31	5.31	20.0	9.41	pCi/Sample	02/23/15 15:31	02/23/15 18:28	1

Other Detected Radionuclides	*MB Result*	*MB Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/23/15 15:31*	*02/23/15 18:28*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-175374/2-A
Matrix: Filter
Analysis Batch: 175294

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 175374

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	31970		3320		104	pCi/Samp	100	87 - 116
Cesium-137	11100	11060		1160	20.0	61.7	pCi/Samp	100	87 - 120
Cobalt-60	11600	11540		1170		38.2	pCi/Samp	99	87 - 115

Lab Sample ID: 160-10545-1 DU
Matrix: Filter
Analysis Batch: 175292

Client Sample ID: WAA-01-AF-PS-20150211
Prep Type: Total/NA
Prep Batch: 175374

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	0.000	U	-2.100	U	5.60	20.0	9.78	pCi/Samp	0.20	1

Other Detected Radionuclides	*Sample Result*	*Sample Qual*	*DU Result*	*DU Qual*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*RER*	*RER Limit*
Other Detected Radionuclide	*None*		*None*					*pCi/Samp*		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-2

Rad

Prep Batch: 175372

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10545-1	WAA-01-AF-PS-20150211	Total/NA	Filter	None	
160-10545-1 DU	WAA-01-AF-PS-20150211	Total/NA	Filter	None	
160-10545-2	WAA-02-AF-PS-20150211	Total/NA	Filter	None	
160-10545-3	WAA-03-AF-PS-20150211	Total/NA	Filter	None	
160-10545-4	WAA-04-AF-PS-20150211	Total/NA	Filter	None	
160-10545-5	WAA-05-AF-PS-20150211	Total/NA	Filter	None	
160-10545-6	WAA-00-AF-FB-20150211	Total/NA	Filter	None	
LCS 160-175372/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-175372/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-175372/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 175374

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10545-1	WAA-01-AF-PS-20150211	Total/NA	Filter	None	
160-10545-1 DU	WAA-01-AF-PS-20150211	Total/NA	Filter	None	
160-10545-2	WAA-02-AF-PS-20150211	Total/NA	Filter	None	
160-10545-3	WAA-03-AF-PS-20150211	Total/NA	Filter	None	
160-10545-4	WAA-04-AF-PS-20150211	Total/NA	Filter	None	
160-10545-5	WAA-05-AF-PS-20150211	Total/NA	Filter	None	
160-10545-6	WAA-00-AF-FB-20150211	Total/NA	Filter	None	
LCS 160-175374/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-175374/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 11, 2015
Sample Delivery Group (SDG):	J10616
Sample Numbers:	WAA-01-AF-PS-20150218, WAA-02-AF-PS-20150218, WAA-03-AF-PS-20150218, WAA-04-AF-PS-20150218, WAA-05-AF-PS-20150218, and WAA-00-AF-FB-20150218
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

11 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10616 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank a low beta activity. The other field samples yielded more than 5 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10616-2
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:
2/26/2015 5:31:11 PM
Elizabeth Hoerchler, Project Mgmt. Assistant
elizabeth.hoerchler@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10616-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10616-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 02/23/2015; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 18.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5) and WAA-00-AF-FB-20150218 (160-10616-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared and analyzed on 02/24/2015.

Gross Alpha and Gross Beta were detected in method blank MB 160-175610/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates, and have been flagged. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Refer to the QC report for details.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 160-10616-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5) and WAA-00-AF-FB-20150218 (160-10616-6) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared on 02/24/2015 and analyzed on 02/25/2015.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 2-23-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	Analysis Turnaround Time			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			Job / SDG No.:
Site: Bridgeton, MO	☐ 2 days			
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
WAA-01-AF-PS-20150218	2/18/15	12:20	Filter	Air	1			X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
WAA-02-AF-PS-20150218	2/18/15	13:05	Filter	Air	1			X	X	X	X	X	X	contingent upon TAR results
WAA-03-AF-PS-20150218	2/18/15	12:40	Filter	Air	1			X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150218	2/18/15	12:55	Filter	Air	1			X	X	X	X	X	X	
WAA-05-AF-PS-20150218	2/18/15	13:15	Filter	Air	1			X	X	X	X	X	X	
WAA-00-AF-FB-20150218	2/18/15	NA	Filter	Air	1			X	X	X	X	X	X	

160-10616 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by: Tully Barbour	Tetra Tech	2/23/15 1040	Received by: Gil Clarke	TA STL	2-23-15 1040
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10616-2

Login Number: 10616

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-2

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10616-1	WAA-01-AF-PS-20150218	Filter	02/18/15 12:20	02/23/15 10:40
160-10616-2	WAA-02-AF-PS-20150218	Filter	02/18/15 13:05	02/23/15 10:40
160-10616-3	WAA-03-AF-PS-20150218	Filter	02/18/15 12:40	02/23/15 10:40
160-10616-4	WAA-04-AF-PS-20150218	Filter	02/18/15 12:55	02/23/15 10:40
160-10616-5	WAA-05-AF-PS-20150218	Filter	02/18/15 13:15	02/23/15 10:40
160-10616-6	WAA-00-AF-FB-20150218	Filter	02/18/15 00:00	02/23/15 10:40

Client Sample ID: WAA-01-AF-PS-20150218

Date Collected: 02/18/15 12:20
Date Received: 02/23/15 10:40

Lab Sample ID: 160-10616-1
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.552	J	0.298	0.304	10.0	0.350	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1
Gross Beta	19.8		1.26	2.35	10.0	0.440	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.22	U	6.35	6.35	20.0	11.4	pCi/Sample	02/24/15 14:44	02/25/15 07:51	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/24/15 14:44*	*02/25/15 07:51*	*1*

Client Sample ID: WAA-02-AF-PS-20150218

Date Collected: 02/18/15 13:05
Date Received: 02/23/15 10:40

Lab Sample ID: 160-10616-2
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.480	J	0.275	0.280	10.0	0.323	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1
Gross Beta	15.8		1.12	1.94	10.0	0.370	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-5.76	U	31.0	31.0	20.0	14.0	pCi/Sample	02/24/15 14:44	02/25/15 07:54	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/24/15 14:44*	*02/25/15 07:54*	*1*

Client Sample ID: WAA-03-AF-PS-20150218

Date Collected: 02/18/15 12:40
Date Received: 02/23/15 10:40

Lab Sample ID: 160-10616-3
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.408	J	0.274	0.277	10.0	0.357	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1
Gross Beta	18.6		1.21	2.22	10.0	0.386	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1

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Client Sample ID: WAA-03-AF-PS-20150218

Lab Sample ID: 160-10616-3
Matrix: Filter

Date Collected: 02/18/15 12:40
Date Received: 02/23/15 10:40

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.926	U	4.96	4.96	20.0	9.11	pCi/Sample	02/24/15 14:44	02/25/15 07:53	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/24/15 14:44*	*02/25/15 07:53*	*1*

Client Sample ID: WAA-04-AF-PS-20150218

Lab Sample ID: 160-10616-4
Matrix: Filter

Date Collected: 02/18/15 12:55
Date Received: 02/23/15 10:40

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.430	J	0.264	0.269	10.0	0.322	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1
Gross Beta	18.6		1.23	2.23	10.0	0.427	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.509	U	9.41	9.41	20.0	16.3	pCi/Sample	02/24/15 14:44	02/25/15 07:53	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/24/15 14:44*	*02/25/15 07:53*	*1*

Client Sample ID: WAA-05-AF-PS-20150218

Lab Sample ID: 160-10616-5
Matrix: Filter

Date Collected: 02/18/15 13:15
Date Received: 02/23/15 10:40

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.645	J	0.325	0.333	10.0	0.380	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1
Gross Beta	17.6		1.17	2.11	10.0	0.418	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.12	U	4.93	4.93	20.0	8.88	pCi/Sample	02/24/15 14:44	02/25/15 09:07	1

HUE 11 Mar 15

Client Sample ID: WAA-05-AF-PS-20150218

Date Collected: 02/18/15 13:15
Date Received: 02/23/15 10:40

Lab Sample ID: 160-10616-5
Matrix: Filter

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	02/24/15 14:44	02/25/15 09:07	1

Client Sample ID: WAA-00-AF-FB-20150218

Date Collected: 02/18/15 00:00
Date Received: 02/23/15 10:40

Lab Sample ID: 160-10616-6
Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.167	U	0.224	0.224	10.0	0.375	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1
Gross Beta	1.95	J	0.445	0.485	10.0	0.417	pCi/Sample	02/24/15 14:42	02/24/15 18:00	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	2.15	U	5.27	5.27	20.0	9.24	pCi/Sample	02/24/15 14:44	02/25/15 09:06	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	02/24/15 14:44	02/25/15 09:06	1

HUG
11 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-2

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-175610/1-A
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 175610

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.4940		0.270	0.276	10.0	0.297	pCi/Sample	02/24/15 14:42	02/24/15 17:59	1
Gross Beta	0.7038		0.309	0.317	10.0	0.394	pCi/Sample	02/24/15 14:42	02/24/15 17:59	1

Lab Sample ID: LCS 160-175610/2-A
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 175610

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.37	5.200		0.991	10.0	0.327	pCi/Samp	97	75 - 125

Lab Sample ID: LCSB 160-175610/3-A
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 175610

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.8	18.20		2.18	10.0	0.439	pCi/Samp	102	75 - 125

Lab Sample ID: 160-10616-1 DU
Matrix: Filter
Analysis Batch: 175568

Client Sample ID: WAA-01-AF-PS-20150218
Prep Type: Total/NA
Prep Batch: 175610

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.552		0.6944		0.320	10.0	0.297	pCi/Samp	0.23	1
Gross Beta	19.8		19.08		2.27	10.0	0.394	pCi/Samp	0.16	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-175612/1-A
Matrix: Filter
Analysis Batch: 175896

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 175612

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	2.636	U	4.89	4.89	20.0	8.46	pCi/Sample	02/24/15 14:44	02/25/15 07:50	1

Other Detected Radionuclides	*MB Result*	*MB Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*02/24/15 14:44*	*02/25/15 07:50*	*1*

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-175612/2-A
Matrix: Filter
Analysis Batch: 175897

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 175612

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	31550		3280		126	pCi/Samp	99	87 - 116
Cesium-137	11100	10990		1160	20.0	74.6	pCi/Samp	99	87 - 120
Cobalt-60	11600	11760		1190		37.8	pCi/Samp	101	87 - 115

Lab Sample ID: 160-10616-1 DU
Matrix: Filter
Analysis Batch: 175896

Client Sample ID: WAA-01-AF-PS-20150218
Prep Type: Total/NA
Prep Batch: 175612

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	-1.22	U	1.100	U	4.10	20.0	7.66	pCi/Samp	0.22	1

Other Detected Radionuclides	*Sample Result*	*Sample Qual*	*DU Result*	*DU Qual*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*RER*	*RER Limit*
Other Detected Radionuclide	*None*		*None*					*pCi/Samp*		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-2

Rad

Prep Batch: 175610

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10616-1	WAA-01-AF-PS-20150218	Total/NA	Filter	None	
160-10616-1 DU	WAA-01-AF-PS-20150218	Total/NA	Filter	None	
160-10616-2	WAA-02-AF-PS-20150218	Total/NA	Filter	None	
160-10616-3	WAA-03-AF-PS-20150218	Total/NA	Filter	None	
160-10616-4	WAA-04-AF-PS-20150218	Total/NA	Filter	None	
160-10616-5	WAA-05-AF-PS-20150218	Total/NA	Filter	None	
160-10616-6	WAA-00-AF-FB-20150218	Total/NA	Filter	None	
LCS 160-175610/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-175610/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-175610/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 175612

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10616-1	WAA-01-AF-PS-20150218	Total/NA	Filter	None	
160-10616-1 DU	WAA-01-AF-PS-20150218	Total/NA	Filter	None	
160-10616-2	WAA-02-AF-PS-20150218	Total/NA	Filter	None	
160-10616-3	WAA-03-AF-PS-20150218	Total/NA	Filter	None	
160-10616-4	WAA-04-AF-PS-20150218	Total/NA	Filter	None	
160-10616-5	WAA-05-AF-PS-20150218	Total/NA	Filter	None	
160-10616-6	WAA-00-AF-FB-20150218	Total/NA	Filter	None	
LCS 160-175612/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-175612/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 12, 2015
Sample Delivery Group (SDG):	J10707
Sample Numbers:	WAA-01-AF-PS-20150225, WAA-02-AF-PS-20150225, WAA-03-AF-PS-20150225, WAA-04-AF-PS-20150228, WAA-05-AF-PS-20150225, and WAA-00-AF-FB-20150225
Matrix / Number of Samples:	5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

12 March 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10707 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded low alpha and beta activities, which is unusual, and the field blank a somewhat higher, but still low beta activity. The other field samples yielded more than 10 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

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TestAmerica

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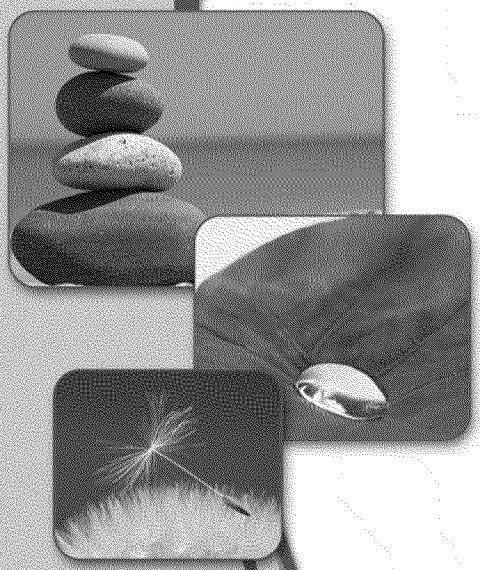

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10707-1
Client Project/Site: West Lake Landfill - Filters

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Authorized for release by:
3/10/2015 6:48:57 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-10707-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10707-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 3/2/2015 10:35 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 18.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150225 (160-10707-1), WAA-02-AF-PS-20150225 (160-10707-2), WAA-03-AF-PS-20150225 (160-10707-3), WAA-04-AF-PS-20150225 (160-10707-4), WAA-05-AF-PS-20150225 (160-10707-5) and WAA-00-AF-FB-20150225 (160-10707-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared on 03/02/2015 and analyzed on 03/03/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150225 (160-10707-1), WAA-02-AF-PS-20150225 (160-10707-2), WAA-03-AF-PS-20150225 (160-10707-3), WAA-04-AF-PS-20150225 (160-10707-4), WAA-05-AF-PS-20150225 (160-10707-5) and WAA-00-AF-FB-20150225 (160-10707-6) were

Job ID: 160-10707-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared on 03/02/2015 and analyzed on 03/04/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

TestAmerica St. Louis
13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Client Contact	Project Manager: Dave Kinroth	Site Contact: Dave Kinroth	Date: 3-2-15	COC No:
Tetra Tech, Inc.	Tel/Fax: 314-517-6798	Lab Contact: Mike Franks	Carrier: NA	1 of 1 COCs
415 Oak Street	**Analysis Turnaround Time**			Sampler:
Kansas City, MO 64106	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(816) 412-1786 Phone	TAT if different from Below 20			Walk-in Client:
(816) 816-410-1748 FAX	☐ 2 weeks			Lab Sampling:
Project Name: West Lake Landfill Site	☐ 1 week			Job / SDG No.:
Site: Bridgeton, MO	☐ 2 days			
P O # 1105610	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)
WAA-01-AF-PS-20150225	2/25/15	11:06	Filter	Air	1			X	X	X	X	X	X
WAA-02-AF-PS-20150225	2/25/15	10:18	Filter	Air	1			X	X	X	X	X	X
WAA-03-AF-PS-20150225	2/25/15	10:42	Filter	Air	1			X	X	X	X	X	X
WAA-04-AF-PS-20150225	2/25/15	10:53	Filter	Air	1			X	X	X	X	X	X
WAA-05-AF-PS-20150225	2/25/15	10:30	Filter	Air	1			X	X	X	X	X	X
WAA-00-AF-FB-20150225	2/25/15	NA	Filter	Air	1			X	X	X	X	X	X

Sample Specific Notes:

* 9315 Radium-226 (GFPC) contingent upon TAR results for all samples

160-10707 Chain of Custody

Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer th

☐Return to Client ☐Disposal by Lab ☐Archive for Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:		Cooler Temp. (°C): Obs'd: Corr'd:		Therm ID No.:
Relinquished by: Terry Bowlsby	Company: Tetra Tech	Date/Time: 1035 2/3/15	Received by:	Company: TAStLouis	Date/Time: 2/3/15 1035
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

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WLLFOIA4312 - 015 - 0156326

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10707-1

Login Number: 10707

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc. TestAmerica Job ID: 160-10707-1
Project/Site: West Lake Landfill - Filters

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-1

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10707-1	WAA-01-AF-PS-20150225	Filter	02/25/15 11:06	03/02/15 10:35
160-10707-2	WAA-02-AF-PS-20150225	Filter	02/25/15 10:18	03/02/15 10:35
160-10707-3	WAA-03-AF-PS-20150225	Filter	02/25/15 10:42	03/02/15 10:35
160-10707-4	WAA-04-AF-PS-20150225	Filter	02/25/15 10:53	03/02/15 10:35
160-10707-5	WAA-05-AF-PS-20150225	Filter	02/25/15 10:30	03/02/15 10:35
160-10707-6	WAA-00-AF-FB-20150225	Filter	02/25/15 00:00	03/02/15 10:35

Client Sample ID: WAA-01-AF-PS-20150225

Lab Sample ID: 160-10707-1
Matrix: Filter

Date Collected: 02/25/15 11:06
Date Received: 03/02/15 10:35

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.751	J	0.333	0.344	10.0	0.350	pCi/Sample	03/02/15 15:34	03/03/15 07:55	1
Gross Beta	29.6		1.53	3.33	10.0	0.440	pCi/Sample	03/02/15 15:34	03/03/15 07:55	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.000	U	1.42	1.42	20.0	8.03	pCi/Sample	03/02/15 15:45	03/04/15 08:47	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*03/02/15 15:45*	*03/04/15 08:47*	*1*

Client Sample ID: WAA-02-AF-PS-20150225

Lab Sample ID: 160-10707-2
Matrix: Filter

Date Collected: 02/25/15 10:18
Date Received: 03/02/15 10:35

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.699	J	0.337	0.346	10.0	0.391	pCi/Sample	03/02/15 15:34	03/03/15 07:56	1
Gross Beta	24.6		1.40	2.83	10.0	0.407	pCi/Sample	03/02/15 15:34	03/03/15 07:56	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.275	U	6.86	6.86	20.0	12.8	pCi/Sample	03/02/15 15:45	03/04/15 07:38	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*03/02/15 15:45*	*03/04/15 07:38*	*1*

Client Sample ID: WAA-03-AF-PS-20150225

Lab Sample ID: 160-10707-3
Matrix: Filter

Date Collected: 02/25/15 10:42
Date Received: 03/02/15 10:35

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.679	J	0.313	0.323	10.0	0.323	pCi/Sample	03/02/15 15:34	03/03/15 07:56	1
Gross Beta	29.5		1.52	3.32	10.0	0.370	pCi/Sample	03/02/15 15:34	03/03/15 07:56	1

HVE 12 March 2015

Client Sample ID: WAA-03-AF-PS-20150225 Lab Sample ID: 160-10707-3

Date Collected: 02/25/15 10:42 Matrix: Filter
Date Received: 03/02/15 10:35

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	3.36	U	5.90	5.91	20.0	10.0	pCi/Sample	03/02/15 15:45	03/04/15 07:39	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*03/02/15 15:45*	*03/04/15 07:39*	*1*

Client Sample ID: WAA-04-AF-PS-20150225 Lab Sample ID: 160-10707-4

Date Collected: 02/25/15 10:53 Matrix: Filter
Date Received: 03/02/15 10:35

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.916	J	0.354	0.369	10.0	0.322	pCi/Sample	03/02/15 15:34	03/03/15 07:56	1
Gross Beta	29.4		1.53	3.32	10.0	0.427	pCi/Sample	03/02/15 15:34	03/03/15 07:56	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-3.20	U	16.6	16.6	20.0	15.8	pCi/Sample	03/02/15 15:45	03/04/15 07:44	1

Other Detected Radionuclides	*Result*	*Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*03/02/15 15:45*	*03/04/15 07:44*	*1*

Client Sample ID: WAA-05-AF-PS-20150225 Lab Sample ID: 160-10707-5

Date Collected: 02/25/15 10:30 Matrix: Filter
Date Received: 03/02/15 10:35

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.929	J	0.371	0.386	10.0	0.380	pCi/Sample	03/02/15 15:37	03/03/15 07:56	1
Gross Beta	25.1		1.39	2.87	10.0	0.418	pCi/Sample	03/02/15 15:37	03/03/15 07:56	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.000	U	1.28	1.28	20.0	11.1	pCi/Sample	03/02/15 15:45	03/04/15 07:43	1

HVE 12 Mar 15

Client Sample ID: WAA-05-AF-PS-20150225

Lab Sample ID: 160-10707-5

Date Collected: 02/25/15 10:30
Date Received: 03/02/15 10:35

Matrix: Filter

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/02/15 15:45	03/04/15 07:43	1

Client Sample ID: WAA-00-AF-FB-20150225

Lab Sample ID: 160-10707-6

Date Collected: 02/25/15 00:00
Date Received: 03/02/15 10:35

Matrix: Filter

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.337	U	0.263	0.266	10.0	0.375	pCi/Sample	03/02/15 15:37	03/03/15 07:56	1
Gross Beta	2.35	J	0.478	0.533	10.0	0.417	pCi/Sample	03/02/15 15:37	03/03/15 07:56	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-4.27	U	47.4	47.4	20.0	16.0	pCi/Sample	03/02/15 15:45	03/04/15 07:42	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/02/15 15:45	03/04/15 07:42	1

H·VG

12 Mar 15

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-1

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-176883/1-A
Matrix: Filter
Analysis Batch: 177069

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 176883

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.4654		0.264	0.269	10.0	0.297	pCi/Sample	03/02/15 15:34	03/03/15 07:55	1
Gross Beta	0.7611		0.316	0.325	10.0	0.394	pCi/Sample	03/02/15 15:34	03/03/15 07:55	1

Lab Sample ID: LCS 160-176883/2-A
Matrix: Filter
Analysis Batch: 177069

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 176883

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Gross Alpha			5.37	5.200		0.991	10.0	0.327	pCi/Samp	97	75 - 125		

Lab Sample ID: LCSB 160-176883/3-A
Matrix: Filter
Analysis Batch: 177069

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 176883

Analyte			Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Gross Beta			17.8	18.28		2.19	10.0	0.439	pCi/Samp	103	75 - 125		

Lab Sample ID: 160-10707-1 DU
Matrix: Filter
Analysis Batch: 177069

Client Sample ID: WAA-01-AF-PS-20150225
Prep Type: Total/NA
Prep Batch: 176883

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Gross Alpha	0.751			1.009		0.381	10.0	0.297	pCi/Samp			0.36	1
Gross Beta	29.6			31.81		3.55	10.0	0.394	pCi/Samp			0.32	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-176886/1-A
Matrix: Filter
Analysis Batch: 177367

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 176886

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	2.770	U	4.58	4.59	20.0	7.78	pCi/Sample	03/02/15 15:45	03/04/15 07:46	1

Other Detected Radionuclides	*MB Result*	*MB Qualifier*	*Count Uncert. (2σ+/-)*	*Total Uncert. (2σ+/-)*	*RL*	*MDC*	*Unit*	*Prepared*	*Analyzed*	*Dil Fac*
Other Detected Radionuclide	*None*						*pCi/Sample*	*03/02/15 15:45*	*03/04/15 07:46*	*1*

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-176886/2-A
Matrix: Filter
Analysis Batch: 177366

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 176886

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Americium-241			32000	31140		3240		120	pCi/Samp	97	87 - 116		
Cesium-137			11100	10840		1140	20.0	66.3	pCi/Samp	98	87 - 120		
Cobalt-60			11600	11360		1150		44.8	pCi/Samp	98	87 - 115		

Lab Sample ID: 160-10707-1 DU
Matrix: Filter
Analysis Batch: 177371

Client Sample ID: WAA-01-AF-PS-20150225
Prep Type: Total/NA
Prep Batch: 176886

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Cesium-137	0.000	U		-0.07843	U	6.64	20.0	12.1	pCi/Samp			0.01	1
Other Detected Radionuclides	***Sample Result***	***Sample Qual***		***DU Result***	***DU Qual***	***Total Uncert. (2σ+/-)***	***RL***	***MDC***	***Unit***			***RER***	***RER Limit***
Other Detected Radionuclide	*None*			*None*					*pCi/Samp*				

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-1

Rad

Prep Batch: 176883

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10707-1	WAA-01-AF-PS-20150225	Total/NA	Filter	None	
160-10707-1 DU	WAA-01-AF-PS-20150225	Total/NA	Filter	None	
160-10707-2	WAA-02-AF-PS-20150225	Total/NA	Filter	None	
160-10707-3	WAA-03-AF-PS-20150225	Total/NA	Filter	None	
160-10707-4	WAA-04-AF-PS-20150225	Total/NA	Filter	None	
160-10707-5	WAA-05-AF-PS-20150225	Total/NA	Filter	None	
160-10707-6	WAA-00-AF-FB-20150225	Total/NA	Filter	None	
LCS 160-176883/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-176883/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-176883/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 176886

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10707-1	WAA-01-AF-PS-20150225	Total/NA	Filter	None	
160-10707-1 DU	WAA-01-AF-PS-20150225	Total/NA	Filter	None	
160-10707-2	WAA-02-AF-PS-20150225	Total/NA	Filter	None	
160-10707-3	WAA-03-AF-PS-20150225	Total/NA	Filter	None	
160-10707-4	WAA-04-AF-PS-20150225	Total/NA	Filter	None	
160-10707-5	WAA-05-AF-PS-20150225	Total/NA	Filter	None	
160-10707-6	WAA-00-AF-FB-20150225	Total/NA	Filter	None	
LCS 160-176886/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-176886/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	Pace Analytical Services, Inc. (Lenexa, Kansas)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 11, 2015
Sample Delivery Group (SDG):	60186505
Sample Numbers:	WAA-01-RV-PS-20150119, WAA-02-RV-PS-20150119, WAA-03-RV-PS-20150119, WAA-04-RV-PS-20150119, WAA-04-RV-DU-20150119, WAA-05-RV-PS-20150119, and WAA-00-RV-TB-20150119
Matrix / Number of Samples:	5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

11 March 2015

Certified by Harry Ellis, Chemist — Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60186505 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank and the field blank. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All LCS results were within QC limits. No qualifications were applied.

V. Surrogates

Several samples, including the field blank and the laboratory blank yielded surrogate recoveries above the QC limits. This may indicate over-sensitivity of the detector in the analytical instrument. All positive results in samples with excessive surrogate recoveries were qualified as estimated and flagged "J".

VI. Comments

No analytes were detected in the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications added. All data are usable as qualified for their intended purposes.

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Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

February 04, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Dear Emily Fisher:
Enclosed are the analytical results for sample(s) received by the laboratory on January 20, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Sherri Rosenstangle

Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
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CERTIFICATIONS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60186505001	**WAA-01-RV-PS-20150119**	Air	01/19/15 14:01	01/20/15 14:06
60186505002	**WAA-02-RV-PS-20150119**	Air	01/19/15 13:14	01/20/15 14:06
60186505003	**WAA-03-RV-PS-20150119**	Air	01/19/15 13:40	01/20/15 14:06
60186505004	**WAA-04-RV-PS-20150119**	Air	01/19/15 13:52	01/20/15 14:06
60186505005	**WAA-05-RV-PS-20150119**	Air	01/19/15 13:20	01/20/15 14:06
60186505006	**WAA-04-RV-DU-20150119**	Air	01/19/15 13:52	01/20/15 14:06
60186505007	**WAA-00-RV-TB-20150119**	Air	01/19/15 13:00	01/20/15 14:06

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60186505001	WAA-01-RV-PS-20150119	TO-17M	RTP	15	PASI-M
60186505002	WAA-02-RV-PS-20150119	TO-17M	RTP	15	PASI-M
60186505003	WAA-03-RV-PS-20150119	TO-17M	RTP	15	PASI-M
60186505004	WAA-04-RV-PS-20150119	TO-17M	RTP	15	PASI-M
60186505005	WAA-05-RV-PS-20150119	TO-17M	RTP	15	PASI-M
60186505006	WAA-04-RV-DU-20150119	TO-17M	RTP	15	PASI-M
60186505007	WAA-00-RV-TB-20150119	TO-17M	RTP	15	PASI-M

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-01-RV-PS-20150119 **Lab ID: 60186505001** Collected: 01/19/15 14:01 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 16:34	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	156-60-5	
Ethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	127-18-4	
Toluene	**0.58**	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	108-88-3	
Trichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 16:34	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 16:34	179601-23-1	
o-Xylene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 16:34	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	124	%.	38-150	1	02/02/15 12:38	02/03/15 16:34	98-08-8	

HVG
11 March 2016

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-02-RV-PS-20150119 **Lab ID: 60186505002** Collected: 01/19/15 13:14 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 17:00	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	156-60-5	
Ethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	127-18-4	
Toluene	**0.56**	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	108-88-3	
Trichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 17:00	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 17:00	179601-23-1	
o-Xylene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:00	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	137	%.	38-150	1	02/02/15 12:38	02/03/15 17:00	98-08-8	

HVE
11 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-03-RV-PS-20150119 **Lab ID: 60186505003** Collected: 01/19/15 13:40 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 17:27	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	156-60-5	
Ethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	127-18-4	
Toluene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	108-88-3	
Trichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 17:27	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 17:27	179601-23-1	
o-Xylene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:27	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	154	%.	38-150	1	02/02/15 12:38	02/03/15 17:27	98-08-8	S3

HVG
11 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-04-RV-PS-20150119 **Lab ID: 60186505004** Collected: 01/19/15 13:52 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 17:54	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	156-60-5	
Ethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	127-18-4	
Toluene	**0.50**	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	108-88-3	J
Trichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 17:54	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 17:54	179601-23-1	
o-Xylene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 17:54	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	180	%.	38-150	1	02/02/15 12:38	02/03/15 17:54	98-08-8	S3

HVG
11 Mar 15

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-05-RV-PS-20150119 **Lab ID: 60186505005** Collected: 01/19/15 13:20 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 18:20	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	156-60-5	
Ethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	127-18-4	
Toluene	**0.39**	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	108-88-3	J
Trichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 18:20	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 18:20	179601-23-1	
o-Xylene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:20	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	157	%.	38-150	1	02/02/15 12:38	02/03/15 18:20	98-08-8	S3

AVG

11 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-04-RV-DU-20150119 **Lab ID: 60186505006** Collected: 01/19/15 13:52 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 18:47	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	156-60-5	
Ethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	127-18-4	
Toluene	**0.56**	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	108-88-3	
Trichloroethene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 18:47	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 18:47	179601-23-1	
o-Xylene	ND	ug/m3	0.048	1	02/02/15 12:38	02/03/15 18:47	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	130	%.	38-150	1	02/02/15 12:38	02/03/15 18:47	98-08-8	

HVE
11 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Sample: WAA-00-RV-TB-20150119 **Lab ID: 60186505007** Collected: 01/19/15 13:00 Received: 01/20/15 14:06 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
Benzene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	71-43-2	
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 19:14	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	156-60-5	
Ethylbenzene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	127-18-4	
Toluene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	108-88-3	
Trichloroethene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	108-67-8	
Vinyl chloride	ND	ug/m3	0.31	1	02/02/15 12:38	02/03/15 19:14	75-01-4	
m&p-Xylene	ND	ug/m3	0.095	1	02/02/15 12:38	02/03/15 19:14	179601-23-1	
o-Xylene	ND	ug/m3	0.047	1	02/02/15 12:38	02/03/15 19:14	95-47-6	
Surrogates								
a,a,a-Trifluorotoluene (S)	241	%.	38-150	1	02/02/15 12:38	02/03/15 19:14	98-08-8	S3

HVG
11 Mar 15

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

QC Batch: AIR/22410 Analysis Method: TO-17M
QC Batch Method: TO-17M Analysis Description: TO17 MSS AIR
Associated Lab Samples: 60186505001, 60186505002, 60186505003, 60186505004, 60186505005, 60186505006, 60186505007

METHOD BLANK: 1892528 Matrix: Air
Associated Lab Samples: 60186505001, 60186505002, 60186505003, 60186505004, 60186505005, 60186505006, 60186505007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	3.2	02/03/15 15:40	
1,3,5-Trimethylbenzene	ug/m3	ND	3.2	02/03/15 15:40	
Benzene	ug/m3	ND	3.2	02/03/15 15:40	
cis-1,2-Dichloroethene	ug/m3	ND	6.4	02/03/15 15:40	
Ethylbenzene	ug/m3	ND	3.2	02/03/15 15:40	
Isopropylbenzene (Cumene)	ug/m3	ND	3.2	02/03/15 15:40	
m&p-Xylene	ug/m3	ND	6.4	02/03/15 15:40	
Methyl-tert-butyl ether	ug/m3	ND	3.2	02/03/15 15:40	
o-Xylene	ug/m3	ND	3.2	02/03/15 15:40	
Tetrachloroethene	ug/m3	ND	3.2	02/03/15 15:40	
Toluene	ug/m3	ND	3.2	02/03/15 15:40	
trans-1,2-Dichloroethene	ug/m3	ND	3.2	02/03/15 15:40	
Trichloroethene	ug/m3	ND	3.2	02/03/15 15:40	
Vinyl chloride	ug/m3	ND	20.8	02/03/15 15:40	
a,a,a-Trifluorotoluene (S)	%.	164	38-150	02/03/15 15:40	S3

LABORATORY CONTROL SAMPLE & LCSD: 1892529 1892530

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	3330	3150	3260	95	98	53-125	3	30	
1,3,5-Trimethylbenzene	ug/m3	3330	3190	3480	96	104	61-125	9	30	
Benzene	ug/m3	2080	2310	2180	111	105	30-150	6	30	
cis-1,2-Dichloroethene	ug/m3	2160	2220	2050	102	95	30-150	8	30	
Ethylbenzene	ug/m3	2450	2440	2600	99	106	62-135	6	30	
Isopropylbenzene (Cumene)	ug/m3	2870	2770	3020	96	105	63-135	9	30	
m&p-Xylene	ug/m3	5120	4640	4890	91	95	61-128	5	30	
Methyl-tert-butyl ether	ug/m3	2560	2690	2430	105	95	30-150	10	30	
o-Xylene	ug/m3	2380	1920	2110	81	89	60-125	9	30	
Tetrachloroethene	ug/m3	2830	2740	2850	97	101	54-139	4	30	
Toluene	ug/m3	2250	2090	2100	93	93	58-134	1	30	
trans-1,2-Dichloroethene	ug/m3	2160	2070	1960	96	91	30-150	6	30	
Trichloroethene	ug/m3	2420	2650	2520	110	104	40-150	5	30	
Vinyl chloride	ug/m3	5410	4400	3780	81	70	30-150	15	30	
a,a,a-Trifluorotoluene (S)	%.				109	105	38-150		30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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(913)599-5665

QUALIFIERS

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

S3	Surrogate recovery exceeded laboratory control limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WESTLAKE LANDFILL
Pace Project No.: 60186505

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60186505001	**WAA-01-RV-PS-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411
60186505002	**WAA-02-RV-PS-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411
60186505003	**WAA-03-RV-PS-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411
60186505004	**WAA-04-RV-PS-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411
60186505005	**WAA-05-RV-PS-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411
60186505006	**WAA-04-RV-DU-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411
60186505007	**WAA-00-RV-TB-20150119**	TO-17M	AIR/22410	TO-17M	AIR/22411

Pace Analytical®	Document Name: Air Sample Condition Upon Receipt	Document Revised: 26Dec2013 Page 1 of 1
	Document No.: F-MN-A-106-rev.09	Issuing Authority: Pace Minnesota Quality Office

Air Sample Condition Upon Receipt

Client Name: Pace KS

Project #: WO# : 60186505

60186505

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other:

Tracking Number: 8065 0379 6215

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No **Seals Intact?** ☑ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other: **Temp Blank rec:** ☑ Yes ☐ No

Temp. (TO17 and TO13 samples only) (°C): 8.5 **Corrected Temp (°C):** 8.5 **Thermom. Used:** ☐ 88A912167504 ☑ 88A9132521491 ☐ 72337080 ☐ 80512447

Temp should be above freezing to 6°C **Correction Factor:** true **Date & Initials of Person Examining Contents:** 12/2015

Type of Ice Received ☐ Blue ☑ Wet ☐ None

				Comments:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☐ Yes	☑ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Media: TO1				11.
Sample Labels Match COC?	☑ Yes	☐ No	☐ N/A	12.

Samples Received:

Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Emily Josh Date/Time: 1.20.15

Comments/Resolution: Okay to report temp @ 8.5

Project Manager Review: JMP **Date:** 1.20.15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Tetra Tech EMI	Report To:	Emily Fisher	Attention:	Emily Fisher
Address:	415 Oak	Copy To:		Company Name:	Tetra Tech
	Kansas City, MO 64106			Address:	415 Oak St, Kansas City, MO 64106
Email To:	Emily.Fisher@tetratech.com	Purchase Order No.:	1111499	Pace Quote Reference:	
Phone:	(816) 412-1755 Fax:	Project Name:	West Lake Landfill	Pace Project Manager:	Sherri Rosenstangle
Requested Due Date/TAT:		Project Number:		Pace Profile #:	970.8

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MO

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW WT
WATER	WW
WASTE WATER	P
PRODUCT	SL
SOIL/SOLID	OL
OIL	WP
WIPE	AR
AIR	OT
OTHER	TS
TISSUE	

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED SAMPLING END DATE/TIME DATE	COLLECTED SAMPLING END DATE/TIME TIME	COLLECTED SAMPLING END DATE/TIME DATE	COLLECTED SAMPLING END DATE/TIME TIME	TOTAL SAMPLING TIME (MINUTES)	AVERAGE SAMPLING TEMPERATURE (°C)	TUBE SERIAL NUMBER	Requested Analysis Filtered (Y/N) Analysis Test Y/N	TO-17 Passive	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	WAA-01-RV-PS-20150119	AR		1/5/14	14:06	1/19/15	14:01	545755	-1.7	197FG		X		40186505
2	WAA-02-RV-PS-20150119	AR		1/5/14	13:09	1/19/15	13:14	545765	-1.7	198FG		X		
3	WAA-03-RV-PS-20150119	AR		1/5/14	13:30	1/19/15	13:40	545770	-1.7	199FG		X		
4	WAA-04-RV-PS-20150119	AR		1/5/14	13:43	1/19/15	13:52	545769	-1.7	200FG		X		
5	WAA-05-RV-PS-20150119	AR		1/5/14	13:19	1/19/15	13:20	545761	-1.7	201FG		X		
6	WAA-04-RV-DU-20150119	AR		1/5/14	13:43	1/19/15	13:52	545769	-1.7	202FG		X		
7	WAA-00-RV-TB-20150119	AR		1/5/14	12:06	1/19/15	13:00	NA	NA	203FG		X		
8														
9														
10														
11														
12														

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
							Temp In °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
					1205	0450	8.5	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: DAVE Klinath

SIGNATURE of SAMPLER: Dave Klinath DATE Signed (MM/DD/YY): 1-19-15

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.08, 12-Oct-2007

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A Required Client Information:

Company:	Tetra Tech EMI
Address:	415 Oak
	Kansas City, MO 64106
Email To:	Emily.Fisher@tetratech.com
Phone: (816) 412-1755	Fax:
Requested Due Date/TAT:	

Section B Required Project Information:

Report To:	Emily Fisher
Copy To:	
Purchase Order No.:	1111499
Project Name:	West Lake Landfill
Project Number:	

Section C Invoice Information:

Attention:	Emily Fisher
Company Name:	Tetra Tech
Address:	415 Oak St, Kansas City, MO 64106
Pace Quote Reference:	
Pace Project Manager:	Sherri Rosenstangle
Pace Profile #:	970.8

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: MO

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: SAMPLING END DATE/TIME DATE (1/21-15 corrected AK)	COLLECTED: SAMPLING END DATE/TIME TIME	COLLECTED: SAMPLING END DATE/TIME DATE	COLLECTED: SAMPLING END DATE/TIME TIME	TOTAL SAMPLING TIME (MINUTES)	AVERAGE SAMPLING TEMPERATURE (°C)	TUBE SERIAL NUMBER	Y/N Analysis Test: TO-17 Passive	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	WAA-01-RV-PS-20150119	AR		1/5/15	14:06	1/19/15	14:01	20155	-1.7	197FG	X		
2	WAA-02-RV-PS-20150119	AR		1/5/15	13:09	1/19/15	13:14	20165	-1.7	198FG	X		
3	WAA-03-RV-PS-20150119	AR		1/5/15	13:30	1/19/15	13:40	20170	-1.7	199FG	X		
4	WAA-04-RV-PS-20150119	AR		1/5/15	13:43	1/19/15	13:52	20169	-1.7	200FG	X		
5	WAA-05-RV-PS-20150119	AR		1/5/15	13:19	1/19/15	13:20	20161	-1.7	201FG	X		
6	WAA-04-RV-DU-20150119	AR		1/5/15	13:43	1/19/15	13:52	20169	-1.7	202FG	X		
7	WAA-00-RV-TB-20150119	AR		1/5/15	12:06	1/19/15	13:00	NA	NA	203FG	X		
8													
9													
10													
11													
12													

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Dave Kinnath	1-21-15	1132				

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Dave Kinnath

SIGNATURE of SAMPLER: Dave Kinnath

DATE Signed (MM/DD/YY): 1-21-15

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	Pace Analytical Services, Inc. (Lenexa, Kansas)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 10, 2015
Sample Delivery Group (SDG):	60187573
Sample Numbers:	WAA-01-RV-PS-20150204, WAA-02-RV-PS-20150204, WAA-03-RV-PS-20150204, WAA-04-RV-PS-20150204, WAA-04-RV-DU-20150204, WAA-05-RV-PS-20150204, and WAA-00-RV-TB-20150204
Matrix / Number of Samples:	5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

10 March 2015

Certified by Harry Ellis, Chemist — Date

DATA VALIDATION QUALIFIERS

U	—	The analyte was not detected above the reported sample quantitation limit.
J	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	—	The analyte was not detected above the reported sample quantitation limit, which is estimated.
R	—	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60187573 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank or the field blank. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

Almost all LCS results were within QC limits. However, methyl tert-butyl ether (MTBE) yielded a recovery of 141 percent, above QC limits of 70 to 130 percent. MTBE was not detected in the field samples so no qualifications were applied.

V. Surrogates

All surrogate recoveries were within QC limits. No qualifications were applied.

VI. Comments

No analytes were detected in the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

February 25, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Dear Emily Fisher:
Enclosed are the analytical results for sample(s) received by the laboratory on February 06, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Sherri Rosenstangle

Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60187573001	**WAA-01-RV-PS-20150204**	Air	02/04/15 14:07	02/06/15 09:45
60187573002	**WAA-02-RV-PS-20150204**	Air	02/04/15 13:29	02/06/15 09:45
60187573003	**WAA-03-RV-PS-20150204**	Air	02/04/15 13:50	02/06/15 09:45
60187573004	**WAA-04-RV-PS-20150204**	Air	02/04/15 13:57	02/06/15 09:45
60187573005	**WAA-05-RV-PS-20150204**	Air	02/04/15 13:37	02/06/15 09:45
60187573006	**WAA-04-RV-DU-20150204**	Air	02/04/15 13:57	02/06/15 09:45
60187573007	**WAA-00-RV-TB-20150204**	Air	02/04/15 14:14	02/06/15 09:45

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60187573001	WAA-01-RV-PS-20150204	TO-17M	RTP	13	PASI-M
60187573002	WAA-02-RV-PS-20150204	TO-17M	RTP	13	PASI-M
60187573003	WAA-03-RV-PS-20150204	TO-17M	RTP	13	PASI-M
60187573004	WAA-04-RV-PS-20150204	TO-17M	RTP	13	PASI-M
60187573005	WAA-05-RV-PS-20150204	TO-17M	RTP	13	PASI-M
60187573006	WAA-04-RV-DU-20150204	TO-17M	RTP	13	PASI-M
60187573007	WAA-00-RV-TB-20150204	TO-17M	RTP	13	PASI-M

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-01-RV-PS-20150204 **Lab ID: 60187573001** Collected: 02/04/15 14:07 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:34	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:34	156-60-5	
Ethylbenzene	**0.19**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:34	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:34	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:34	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:34	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:34	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:34	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:34	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:34	75-01-4	
m&p-Xylene	**0.50**	ug/m3	0.19	1	02/11/15 08:08	02/11/15 12:34	179601-23-1	
o-Xylene	**0.18**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:34	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	104	%		1	02/11/15 08:08	02/11/15 12:34	3114-55-4	

HVE
10 March 2015

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-02-RV-PS-20150204 **Lab ID: 60187573002** Collected: 02/04/15 13:29 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:05	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:05	156-60-5	
Ethylbenzene	**0.18**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:05	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:05	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:05	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:05	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:05	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:05	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:05	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:05	75-01-4	
m&p-Xylene	**0.48**	ug/m3	0.19	1	02/11/15 08:08	02/11/15 13:05	179601-23-1	
o-Xylene	**0.17**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:05	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	105	%.		1	02/11/15 08:08	02/11/15 13:05	3114-55-4	

HVG
10 Mar 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-03-RV-PS-20150204 **Lab ID: 60187573003** Collected: 02/04/15 13:50 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:36	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:36	156-60-5	
Ethylbenzene	**0.18**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:36	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:36	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:36	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:36	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:36	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:36	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 13:36	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:36	75-01-4	
m&p-Xylene	**0.47**	ug/m3	0.19	1	02/11/15 08:08	02/11/15 13:36	179601-23-1	
o-Xylene	**0.17**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 13:36	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	104	%.		1	02/11/15 08:08	02/11/15 13:36	3114-55-4	

AJE
19 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-04-RV-PS-20150204 **Lab ID: 60187573004** Collected: 02/04/15 13:57 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:07	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:07	156-60-5	
Ethylbenzene	**0.16**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:07	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:07	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:07	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:07	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:07	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:07	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:07	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:07	75-01-4	
m&p-Xylene	**0.41**	ug/m3	0.19	1	02/11/15 08:08	02/11/15 14:07	179601-23-1	
o-Xylene	**0.15**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:07	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	105	%.		1	02/11/15 08:08	02/11/15 14:07	3114-55-4	

MVG
19 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-05-RV-PS-20150204 **Lab ID: 60187573005** Collected: 02/04/15 13:37 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:56	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:56	156-60-5	
Ethylbenzene	**0.17**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:56	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:56	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:56	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:56	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:56	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:56	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 14:56	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:56	75-01-4	
m&p-Xylene	**0.44**	ug/m3	0.19	1	02/11/15 08:08	02/11/15 14:56	179601-23-1	
o-Xylene	**0.16**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 14:56	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	104	%.		1	02/11/15 08:08	02/11/15 14:56	3114-55-4	

HUG
10 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-04-RV-DU-20150204 **Lab ID: 60187573006** Collected: 02/04/15 13:57 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 15:27	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 15:27	156-60-5	
Ethylbenzene	**0.18**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 15:27	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 15:27	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 15:27	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 15:27	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 15:27	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 15:27	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 15:27	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 15:27	75-01-4	
m&p-Xylene	**0.47**	ug/m3	0.19	1	02/11/15 08:08	02/11/15 15:27	179601-23-1	
o-Xylene	**0.17**	ug/m3	0.095	1	02/11/15 08:08	02/11/15 15:27	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	105	%.		1	02/11/15 08:08	02/11/15 15:27	3114-55-4	

HVE
10 Mar 15

REPORT OF LABORATORY ANALYSIS

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Lenexa, KS 66219
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ANALYTICAL RESULTS

Project WEST LAKE LANDFILL
Pace Project No.: 60187573

Sample: WAA-00-RV-TB-20150204 **Lab ID: 60187573007** Collected: 02/04/15 14:14 Received: 02/06/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:03	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:03	156-60-5	
Ethylbenzene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:03	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:03	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:03	1634-04-4	CH,L1
Tetrachloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:03	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:03	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:03	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/11/15 08:08	02/11/15 12:03	108-67-8	
Vinyl chloride	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:03	75-01-4	
m&p-Xylene	ND	ug/m3	0.19	1	02/11/15 08:08	02/11/15 12:03	179601-23-1	
o-Xylene	ND	ug/m3	0.095	1	02/11/15 08:08	02/11/15 12:03	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	100	%		1	02/11/15 08:08	02/11/15 12:03	3114-55-4	

HJG
19 Mar 15

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

QC Batch: AIR/22479 Analysis Method: TO-17M
QC Batch Method: TO-17M Analysis Description: TO17 MSS AIR
Associated Lab Samples: 60187573001, 60187573002, 60187573003, 60187573004, 60187573005, 60187573006, 60187573007

METHOD BLANK: 1897770 Matrix: Air
Associated Lab Samples: 60187573001, 60187573002, 60187573003, 60187573004, 60187573005, 60187573006, 60187573007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.24	02/11/15 10:43	
1,3,5-Trimethylbenzene	ug/m3	ND	0.24	02/11/15 10:43	
cis-1,2-Dichloroethene	ug/m3	ND	0.095	02/11/15 10:43	
Ethylbenzene	ug/m3	ND	0.095	02/11/15 10:43	
Isopropylbenzene (Cumene)	ug/m3	ND	0.24	02/11/15 10:43	
m&p-Xylene	ug/m3	ND	0.19	02/11/15 10:43	
Methyl-tert-butyl ether	ug/m3	ND	0.095	02/11/15 10:43	
o-Xylene	ug/m3	ND	0.095	02/11/15 10:43	
Tetrachloroethene	ug/m3	ND	0.24	02/11/15 10:43	
trans-1,2-Dichloroethene	ug/m3	ND	0.095	02/11/15 10:43	
Trichloroethene	ug/m3	ND	0.24	02/11/15 10:43	
Vinyl chloride	ug/m3	ND	0.095	02/11/15 10:43	
Chlorobenzene-d5 (S)	%.	97		02/11/15 10:43	

LABORATORY CONTROL SAMPLE: 1897771

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	151	155	102	70-130	
1,3,5-Trimethylbenzene	ug/m3	151	150	99	70-130	
cis-1,2-Dichloroethene	ug/m3	102	109	107	70-130	
Ethylbenzene	ug/m3	113	115	102	70-130	
Isopropylbenzene (Cumene)	ug/m3	126	132	105	70-130	
m&p-Xylene	ug/m3	219	222	102	70-130	
Methyl-tert-butyl ether	ug/m3	80.9	114	141	70-130	CH,L0
o-Xylene	ug/m3	118	121	102	70-130	
Tetrachloroethene	ug/m3	178	184	103	70-130	
trans-1,2-Dichloroethene	ug/m3	102	109	107	70-130	
Trichloroethene	ug/m3	133	145	109	70-130	
Vinyl chloride	ug/m3	66	65.5	99	70-130	
Chlorobenzene-d5 (S)	%.			96		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

CH	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased high.
L0	Analyte recovery in the laboratory control sample (LCS) was outside QC limits.
L1	Analyte recovery in the laboratory control sample (LCS) was above QC limits. Results may be biased high.

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WEST LAKE LANDFILL
Pace Project No.: 60187573

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60187573001	**WAA-01-RV-PS-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480
60187573002	**WAA-02-RV-PS-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480
60187573003	**WAA-03-RV-PS-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480
60187573004	**WAA-04-RV-PS-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480
60187573005	**WAA-05-RV-PS-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480
60187573006	**WAA-04-RV-DU-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480
60187573007	**WAA-00-RV-TB-20150204**	TO-17M	AIR/22479	TO-17M	AIR/22480

Pace Analytical	Document Name: Air Sample Condition Upon Receipt	Document Revised: 26Dec2013 Page 1 of 1
	Document No.: F-MN-A-106-rev.09	Issuing Authority: Pace Minnesota Quality Office

Air Sample Condition Upon Receipt

Client Name: Pace KS

Project #: WO#: 60187573

60187573

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other:

Tracking Number: 778435839038

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No Seals Intact? ☑ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other: Temp Blank rec: ☐ Yes ☐ No

Temp. (TO17 and TO13 samples only) (°C): 3.4 Corrected Temp (°C): 3.5 Thermom. Used: ☑ B88A912167504 ☐ B88A9132521491 ☐ 72337080 ☐ 80512447

Temp should be above freezing to 6°C Correction Factor: +0.1 Date & Initials of Person Examining Contents: 2.6.15

Type of Ice Received ☑ Blue ☐ Wet ☐ None

				Comments:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Media: TDT				11.
Sample Labels Match COC?	☑ Yes	☐ No	☐ N/A	12.

Samples Received:

Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID

CLIENT NOTIFICATION/RESOLUTION Field Data Required? ☐ Yes ☐ No

Person Contacted: Date/Time:

Comments/Resolution:

Project Manager Review: Date: 2.6.15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Tetra Tech EMI
Address:	415 Oak
	Kansas City, MO 64106
Email To:	Emily.Fisher@tetratech.com
Phone: (816) 412-1755	Fax:
Requested Due Date/TAT:	

Section B Required Project Information:

Report To:	Emily Fisher
Copy To:	
Purchase Order No.:	1111499
Project Name:	West Lake Landfill
Project Number:	

Section C Invoice Information:

Attention:	Emily Fisher
Company Name:	Tetra Tech
Address:	415 Oak St, Kansas City, MO 64106
Pace Quote Reference:	
Pace Project Manager:	Sherri Rosenstangle
Pace Profile #:	970.8

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MO

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW WT
WATER	WW
WASTE WATER	P
PRODUCT	SL
SOIL/SOLID	OL
OIL	WP
WIPE	AR
AIR	OT
OTHER	TS
TISSUE	

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	TOTAL SAMPLING TIME (MINUTES)	AVERAGE SAMPLING TEMPERATURE (°C)	TUBE SERIAL NUMBER	Requested Analysis Filtered (Y/N) Y/N	Analysis Test: TO-17 Passive	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	WAA-01-RV-PS-20150204	AR		1/28/15	14:02	2/4/15	14:07	10085	2.2	781BN		X		
2	WAA-02-RV-PS-20150204	AR		1/28/15	13:21	2/4/15	13:29	10088	2.2	784BN		X		
3	WAA-03-RV-PS-20150204	AR		1/28/15	13:39	2/4/15	13:50	10091	2.2	785BN		X		
4	WAA-04-RV-PS-20150204	AR		1/28/15	13:53	2/4/15	13:57	10084	2.2	786BN		X		
5	WAA-05-RV-PS-20150204	AR		1/28/15	13:29	2/4/15	13:37	10088	2.2	787BN		X		
6	WAA-04-RV-DU-20150204	AR		1/28/15	13:53	2/4/15	13:57	10084	2.2	788BN		X		
7	WAA-00-RV-TB-20150204	AR		1/28/15	13:15	2/4/15	14:14	NA	NA	782BN		X		
8														
9														
10														
11														
12														

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Timothy Barbeau / Tetra Tech	2/5/15	1330	Pace	2/6/15	0945	3.5	Y	Y	Y

SAMPLER NAME AND SIGNATURE				
PRINT Name of SAMPLER:	Timothy Barbeau			
SIGNATURE of SAMPLER:	Timothy Barbeau	DATE Signed (MM/DD/YY):	02/05/15	

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	Pace Analytical Services, Inc. (Lenexa, Kansas)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 10, 2015
Sample Delivery Group (SDG):	60188142
Sample Numbers:	WAA-01-RV-PS-20150213, WAA-02-RV-PS-20150213, WAA-03-RV-PS-20150213, WAA-04-RV-PS-20150213, WAA-04-RV-DU-20150213,nWAA-05-RV-PS-20150213, and WAA-00-RV-TB-20150213
Matrix / Number of Samples:	5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

10 March 2015

Certified by Harry Ellis, Chemist — Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60188142 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank. The field blank yielded a low concentration of m+p-yxlenes. The other field samples yielded concentrations about 3 times as large, which may be, in part, the blank contamination. Therefore the sample results for m+p-xylenes were qualified as estimated and flagged "J".

IV. Laboratory Control Sample (LCS)

All LCS results were within QC limits. No qualifications were applied.

V. Surrogates

All surrogate recoveries were within QC limits. No qualifications were applied.

VI. Comments

No analytes were detected in the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

March 03, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Dear Emily Fisher:
Enclosed are the analytical results for sample(s) received by the laboratory on February 17, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Sherri Rosenstangle

Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60188142001	**WAA-01-RV-PS-20150213**	Air	02/13/15 13:54	02/17/15 09:20
60188142002	**WAA-02-RV-PS-20150213**	Air	02/13/15 13:03	02/17/15 09:20
60188142003	**WAA-03-RV-PS-20150213**	Air	02/13/15 13:30	02/17/15 09:20
60188142004	**WAA-04-RV-PS-20150213**	Air	02/13/15 13:42	02/17/15 09:20
60188142005	**WAA-05-RV-PS-20150213**	Air	02/13/15 13:16	02/17/15 09:20
60188142006	**WAA-01-RV-DU-20150213**	Air	02/13/15 13:54	02/17/15 09:20
60188142007	**WAA-00-RV-TB-20150213**	Air	02/13/15 14:13	02/17/15 09:20

Pace Analytical Services, Inc.
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(913)599-5665

SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60188142001	WAA-01-RV-PS-20150213	TO-17M	RTP	13	PASI-M
60188142002	WAA-02-RV-PS-20150213	TO-17M	RTP	13	PASI-M
60188142003	WAA-03-RV-PS-20150213	TO-17M	RTP	13	PASI-M
60188142004	WAA-04-RV-PS-20150213	TO-17M	RTP	13	PASI-M
60188142005	WAA-05-RV-PS-20150213	TO-17M	RTP	13	PASI-M
60188142006	WAA-01-RV-DU-20150213	TO-17M	RTP	13	PASI-M
60188142007	WAA-00-RV-TB-20150213	TO-17M	RTP	13	PASI-M

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Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-01-RV-PS-20150213 **Lab ID: 60188142001** Collected: 02/13/15 13:54 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 17:39	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 17:39	156-60-5	
Ethylbenzene	**0.19**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 17:39	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 17:39	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 17:39	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 17:39	127-18-4	
Trichloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 17:39	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 17:39	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 17:39	108-67-8	
Vinyl chloride	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 17:39	75-01-4	
m&p-Xylene	**0.51** J	ug/m3	0.15	1	02/26/15 07:40	02/26/15 17:39	179601-23-1	
o-Xylene	**0.18**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 17:39	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	117	%		1	02/26/15 07:40	02/26/15 17:39	3114-55-4	

HVE
1st March 2015

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-02-RV-PS-20150213 **Lab ID: 60188142002** Collected: 02/13/15 13:03 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:10	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:10	156-60-5	
Ethylbenzene	**0.19**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:10	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:10	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:10	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:10	127-18-4	
Trichloroethene	**0.33**	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:10	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:10	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:10	108-67-8	
Vinyl chloride	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:10	75-01-4	
m&p-Xylene	**0.49**	ug/m3	0.15	1	02/26/15 07:40	02/26/15 18:10	179601-23-1	J
o-Xylene	**0.18**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:10	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	115	%.		1	02/26/15 07:40	02/26/15 18:10	3114-55-4	

HJG
10 Mar 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-03-RV-PS-20150213 **Lab ID: 60188142003** Collected: 02/13/15 13:30 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:41	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:41	156-60-5	
Ethylbenzene	**0.20**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:41	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:41	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:41	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:41	127-18-4	
Trichloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:41	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:41	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 18:41	108-67-8	
Vinyl chloride	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:41	75-01-4	
m&p-Xylene	**0.52**	ug/m3	0.15	1	02/26/15 07:40	02/26/15 18:41	179601-23-1	J
o-Xylene	**0.19**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 18:41	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	115	%.		1	02/26/15 07:40	02/26/15 18:41	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-04-RV-PS-20150213 **Lab ID: 60188142004** Collected: 02/13/15 13:42 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 19:12	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 19:12	156-60-5	
Ethylbenzene	**0.19**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 19:12	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 19:12	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 19:12	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 19:12	127-18-4	
Trichloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 19:12	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 19:12	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 19:12	108-67-8	
Vinyl chloride	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 19:12	75-01-4	
m&p-Xylene	**0.47** J	ug/m3	0.15	1	02/26/15 07:40	02/26/15 19:12	179601-23-1	
o-Xylene	**0.17**	ug/m3	0.074	1	02/26/15 07:40	02/26/15 19:12	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	112	%		1	02/26/15 07:40	02/26/15 19:12	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-05-RV-PS-20150213 **Lab ID: 60188142005** Collected: 02/13/15 13:16 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/27/15 07:29	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/27/15 07:29	156-60-5	
Ethylbenzene	**0.26**	ug/m3	0.074	1	02/26/15 07:40	02/27/15 07:29	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.19	1	02/26/15 07:40	02/27/15 07:29	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.074	1	02/26/15 07:40	02/27/15 07:29	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/27/15 07:29	127-18-4	
Trichloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/27/15 07:29	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/27/15 07:29	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/27/15 07:29	108-67-8	
Vinyl chloride	ND	ug/m3	0.074	1	02/26/15 07:40	02/27/15 07:29	75-01-4	
m&p-Xylene	**0.66**	J ug/m3	0.15	1	02/26/15 07:40	02/27/15 07:29	179601-23-1	
o-Xylene	**0.24**	ug/m3	0.074	1	02/26/15 07:40	02/27/15 07:29	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	105	%.		1	02/26/15 07:40	02/27/15 07:29	3114-55-4	

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10 Mar 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-01-RV-DU-20150213 **Lab ID: 60188142006** Collected: 02/13/15 13:54 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.088	1.19	02/27/15 08:34	02/27/15 15:13	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.088	1.19	02/27/15 08:34	02/27/15 15:13	156-60-5	
Ethylbenzene	**0.21**	ug/m3	0.088	1.19	02/27/15 08:34	02/27/15 15:13	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.22	1.19	02/27/15 08:34	02/27/15 15:13	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.088	1.19	02/27/15 08:34	02/27/15 15:13	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.22	1.19	02/27/15 08:34	02/27/15 15:13	127-18-4	
Trichloroethene	ND	ug/m3	0.22	1.19	02/27/15 08:34	02/27/15 15:13	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.22	1.19	02/27/15 08:34	02/27/15 15:13	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.22	1.19	02/27/15 08:34	02/27/15 15:13	108-67-8	
Vinyl chloride	ND	ug/m3	0.088	1.19	02/27/15 08:34	02/27/15 15:13	75-01-4	
m&p-Xylene	**0.49**	ug/m3	0.18	1.19	02/27/15 08:34	02/27/15 15:13	179601-23-1	J
o-Xylene	**0.18**	ug/m3	0.088	1.19	02/27/15 08:34	02/27/15 15:13	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	104	%.		1.19	02/27/15 08:34	02/27/15 15:13	3114-55-4	

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18 Mar 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Sample: WAA-00-RV-TB-20150213 **Lab ID: 60188142007** Collected: 02/13/15 14:13 Received: 02/17/15 09:20 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 15:35	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 15:35	156-60-5	
Ethylbenzene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 15:35	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 15:35	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 15:35	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 15:35	127-18-4	
Trichloroethene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 15:35	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 15:35	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.19	1	02/26/15 07:40	02/26/15 15:35	108-67-8	
Vinyl chloride	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 15:35	75-01-4	
m&p-Xylene	**0.17**	ug/m3	0.15	1	02/26/15 07:40	02/26/15 15:35	179601-23-1	
o-Xylene	ND	ug/m3	0.074	1	02/26/15 07:40	02/26/15 15:35	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	110	%.		1	02/26/15 07:40	02/26/15 15:35	3114-55-4	

AUG
10 Mar 15

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

QC Batch: AIR/22599 Analysis Method: TO-17M
QC Batch Method: TO-17M Analysis Description: TO17 MSS AIR
Associated Lab Samples: 60188142001, 60188142002, 60188142003, 60188142004, 60188142005, 60188142007

METHOD BLANK: 1908195 Matrix: Air
Associated Lab Samples: 60188142001, 60188142002, 60188142003, 60188142004, 60188142005, 60188142007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.19	02/26/15 14:46	
1,3,5-Trimethylbenzene	ug/m3	ND	0.19	02/26/15 14:46	
cis-1,2-Dichloroethene	ug/m3	ND	0.074	02/26/15 14:46	
Ethylbenzene	ug/m3	ND	0.074	02/26/15 14:46	
Isopropylbenzene (Cumene)	ug/m3	ND	0.19	02/26/15 14:46	
m&p-Xylene	ug/m3	ND	0.15	02/26/15 14:46	
Methyl-tert-butyl ether	ug/m3	ND	0.074	02/26/15 14:46	
o-Xylene	ug/m3	ND	0.074	02/26/15 14:46	
Tetrachloroethene	ug/m3	ND	0.19	02/26/15 14:46	
trans-1,2-Dichloroethene	ug/m3	ND	0.074	02/26/15 14:46	
Trichloroethene	ug/m3	ND	0.19	02/26/15 14:46	
Vinyl chloride	ug/m3	ND	0.074	02/26/15 14:46	
Chlorobenzene-d5 (S)	%.	102		02/26/15 14:46	

LABORATORY CONTROL SAMPLE: 1908196

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.12	.12J	104	70-130	
1,3,5-Trimethylbenzene	ug/m3	.12	.12J	100	70-130	
cis-1,2-Dichloroethene	ug/m3	.08	0.089	112	70-130	
Ethylbenzene	ug/m3	.089	0.089	100	70-130	
Isopropylbenzene (Cumene)	ug/m3	.099	.1J	104	70-130	
m&p-Xylene	ug/m3	.086	.089J	104	70-130	
Methyl-tert-butyl ether	ug/m3	.063	.048J	76	70-130	
o-Xylene	ug/m3	.092	0.096	104	70-130	
Tetrachloroethene	ug/m3	.14	.15J	107	70-130	
trans-1,2-Dichloroethene	ug/m3	.08	0.087	109	70-130	
Trichloroethene	ug/m3	.1	.11J	110	70-130	
Vinyl chloride	ug/m3	.052	.056J	109	70-130	
Chlorobenzene-d5 (S)	%.			105		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

QC Batch: AIR/22603 Analysis Method: TO-17M
QC Batch Method: TO-17M Analysis Description: TO17 MSS AIR
Associated Lab Samples: 60188142006

METHOD BLANK: 1908303 Matrix: Air
Associated Lab Samples: 60188142006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.24	02/27/15 11:02	
1,3,5-Trimethylbenzene	ug/m3	ND	0.24	02/27/15 11:02	
cis-1,2-Dichloroethene	ug/m3	ND	0.096	02/27/15 11:02	
Ethylbenzene	ug/m3	ND	0.096	02/27/15 11:02	
Isopropylbenzene (Cumene)	ug/m3	ND	0.24	02/27/15 11:02	
m&p-Xylene	ug/m3	ND	0.19	02/27/15 11:02	
Methyl-tert-butyl ether	ug/m3	ND	0.096	02/27/15 11:02	
o-Xylene	ug/m3	ND	0.096	02/27/15 11:02	
Tetrachloroethene	ug/m3	ND	0.24	02/27/15 11:02	
trans-1,2-Dichloroethene	ug/m3	ND	0.096	02/27/15 11:02	
Trichloroethene	ug/m3	ND	0.24	02/27/15 11:02	
Vinyl chloride	ug/m3	ND	0.096	02/27/15 11:02	
Chlorobenzene-d5 (S)	%.	99		02/27/15 11:02	

LABORATORY CONTROL SAMPLE: 1908304

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.15	.16J	103	70-130	
1,3,5-Trimethylbenzene	ug/m3	.15	.15J	101	70-130	
cis-1,2-Dichloroethene	ug/m3	.1	0.11	106	70-130	
Ethylbenzene	ug/m3	.11	0.12	106	70-130	
Isopropylbenzene (Cumene)	ug/m3	.13	.14J	108	70-130	
m&p-Xylene	ug/m3	.22	0.24	106	70-130	
Methyl-tert-butyl ether	ug/m3	.082	.091J	111	70-130	
o-Xylene	ug/m3	.12	0.12	104	70-130	
Tetrachloroethene	ug/m3	.18	.19J	106	70-130	
trans-1,2-Dichloroethene	ug/m3	.1	0.11	108	70-130	
Trichloroethene	ug/m3	.14	.14J	104	70-130	
Vinyl chloride	ug/m3	.067	.078J	116	70-130	
Chlorobenzene-d5 (S)	%.			99		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WEST LAKE LANDFILL
Pace Project No.: 60188142

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60188142001	**WAA-01-RV-PS-20150213**	TO-17M	AIR/22599	TO-17M	AIR/22600
60188142002	**WAA-02-RV-PS-20150213**	TO-17M	AIR/22599	TO-17M	AIR/22600
60188142003	**WAA-03-RV-PS-20150213**	TO-17M	AIR/22599	TO-17M	AIR/22600
60188142004	**WAA-04-RV-PS-20150213**	TO-17M	AIR/22599	TO-17M	AIR/22600
60188142005	**WAA-05-RV-PS-20150213**	TO-17M	AIR/22599	TO-17M	AIR/22600
60188142006	**WAA-01-RV-DU-20150213**	TO-17M	AIR/22603	TO-17M	AIR/22604
60188142007	**WAA-00-RV-TB-20150213**	TO-17M	AIR/22599	TO-17M	AIR/22600

Pace Analytical	Document Name: Air Sample Condition Upon Receipt	Document Revised: 26Dec2013 Page 1 of 1
	Document No.: F-MN-A-106-rev.09	Issuing Authority: Pace Minnesota Quality Office

Air Sample Condition Upon Receipt

Client Name: Pace Pa

Project #: WO# : 60188142

60188142

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other: _____

Tracking Number: 7729 1959 0507

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No **Seals Intact?** ☑ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☑ Bubble Bags ☐ Foam ☐ None ☐ Other: _____ **Temp Blank rec:** ☑ Yes ☐ No

Temp. (TO17 and TO13 samples only) (°C): 2.9 **Corrected Temp (°C):** 2.9 **Thermom. Used:** ☐ B88A912167504 ☑ B88A9132521491 ☐ 72337080 ☐ 80512447

Temp should be above freezing to 6°C **Correction Factor:** None **Date & Initials of Person Examining Contents:** 2/21/15

Type of Ice Received ☑ Blue ☐ Wet ☐ None

				Comments:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☐ Yes	☑ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Media: TDT passive				11.
Sample Labels Match COC?	☑ Yes	☐ No	☐ N/A	12.

Samples Received:

Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID

CLIENT NOTIFICATION/RESOLUTION

Field Data Required? ☐ Yes ☐ No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review: _____ **Date:** 2.17.15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Tetra Tech EMI	Report To:	Emily Fisher	Attention:	Emily Fisher
Address:	415 Oak	Copy To:		Company Name:	Tetra Tech
	Kansas City, MO 64106			Address:	415 Oak St, Kansas City, MO 64106
Email To:	Emily.Fisher@tetratech.com	Purchase Order No.:	1111499	Pace Quote Reference:	
Phone:	(816) 412-1755 Fax:	Project Name:	West Lake Landfill	Pace Project Manager:	Sherri Rosenstangle
Requested Due Date/TAT:		Project Number:		Pace Profile #:	970.8

REGULATORY AGENCY: ☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER ☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MO

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW WT
WATER	WW
WASTE WATER	P
PRODUCT	SL
SOIL/SOLID	OL
OIL	WP
WIPE	AR
AIR	OT
OTHER	TS
TISSUE	

ITEM #	SAMPLE ID	MATRIX CODE (use valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: SAMPLING END DATE/TIME DATE	COLLECTED: SAMPLING END DATE/TIME TIME	COLLECTED: SAMPLING END DATE/TIME DATE	COLLECTED: SAMPLING END DATE/TIME TIME	TOTAL SAMPLING TIME (MINUTES)	AVERAGE SAMPLING TEMPERATURE (°C)	TUBE SERIAL NUMBER	Requested Analysis Filtered (Y/N) Y/N	Analysis Test	TO-17 Passive	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	WAA-01-RV-PS-20150213	AR		2/4/15	14:07	2/13/15	13:54	12947	1.7	790BN			X		
2	WAA-02-RV-PS-20150213	AR		2/4/15	13:29	2/13/15	13:03	12934	1.7	791BN			X		
3	WAA-03-RV-PS-20150213	AR		2/4/15	13:50	2/13/15	13:30	12940	1.7	793BN			X		
4	WAA-04-RV-PS-20150213	AR		2/4/15	13:57	2/13/15	13:42	12945	1.7	794BN			X		
5	WAA-05-RV-PS-20150213	AR		2/4/15	13:37	2/13/15	13:16	12939	1.7	795BN			X		
6	WAA-01-RV-DU-20150213	AR		2/4/15	14:07	2/13/15	13:54	12947	1.7	798BN			X		
7	WAA-00-RV-TB-20150213	AR		2/4/15	13:02	2/13/15	14:13	NA	NA	382ME			X		
8															
9															
10															
11															
12															

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Tony Balsaw/TetraTech	2-16-15	1400	Pace	21715	0920	2.9	Y	Y	Y

SAMPLER NAME AND SIGNATURE				
PRINT Name of SAMPLER:		Temp In °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):				

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	ALS Environmental (Simi Valley, California)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 13, 2015
Sample Delivery Group (SDG):	P1500074
Sample Numbers:	WAA-01-RH-PS-20150105, WAA-02-RH-PS-20150105, WAA-03-RH-PS-20150105, WAA-04-RH-PS-20150105, WAA-04-RH-DU-20150105, WAA-05-RH-PS-20150105, and WAA-00-RH-TB-20150105
Matrix / Number of Samples:	5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

13 March 2015

Certified by Harry Ellis, Chemist — Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1500074 included five (5) environmental air (Radiello™ adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

All detected results in the field samples were less than the sample reporting limits, which correspond to the lowest calibration standard. The laboratory correctly qualified these results as estimated and flagged them "J". All detected results, including the field duplicate pair, were quite similar.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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www.alsglobal.com

LABORATORY REPORT

January 24, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on January 8, 2015. For your reference, these analyses have been assigned our service request number P1500074.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

By Sue Anderson at 9:18 am, Jan 24, 2015

Sue Anderson
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1500074

CASE NARRATIVE

The samples were received intact under chain of custody on January 8, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H_2S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	838341
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272014-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Service Request: P1500074
Project ID: West Lake Landfill / 103X9025140058

Date Received: 1/8/2015
Time Received: 13:58

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	CAS AQL 110 - H2S Air
WAA-01-RH-PS-20150105	P1500074-001	Air	1/5/2015	14:06	X
WAA-02-RH-PS-20150105	P1500074-002	Air	1/5/2015	13:09	X
WAA-03-RH-PS-20150105	P1500074-003	Air	1/5/2015	13:30	X
WAA-04-RH-PS-20150105	P1500074-004	Air	1/5/2015	13:43	X
WAA-05-RH-PS-20150105	P1500074-005	Air	1/5/2015	13:19	X
WAA-04-RH-DU-20150105	P1500074-006	Air	1/5/2015	13:43	X
WAA-00-RH-TB-20150105	P1500074-007	Air	1/5/2015	14:15	X

Radiello - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No. P1500074

Company Name & Address (Reporting Information)	**Tetra Tech** **415 Oak Street,** **Kansas City, MO 64106**
Project Manager	**Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)**
Phone / Fax	**816-412-1775** / **816-410-1748**
Email Address for Result Reporting	**emily.fisher@tetratech.com**
Project Name	**West Lake Landfill**
Project Number	**103X9025140058**
P.O. # / Credit Card / Billing Information	**PO 1111500** **Attn: Emily Fisher** **415 Oak Street, Kansas City, MO 64106** **emily.fisher@tetratech.com**
ALS Contact:	Sue Anderson

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number	Analysis: (e.g. NO_2, SO_2, O_3, VOCs, Aldehyde, Ammonia) Hydrogen Sulfide			Comments
WAA-01-RH-PS-20150105	1	12/27/14 @ 11:17	1/5/15 @ 14:06	13129	-0.6	674GS	X			
WAA-02-RH-PS-20150105	2	12/27/14 @ 11:19	1/5/15 @ 13:09	13070	-0.6	675GS	X			
WAA-03-RH-PS-20150105	3	12/27/14 @ 11:40	1/5/15 @ 13:30	13070	-0.6	676GS	X			
WAA-04-RH-PS-20150105	4	12/27/14 @ 11:30	1/5/15 @ 13:43	13093	-0.6	677GS	X			
WAA-05-RH-PS-20150105	5	12/27/14 @ 11:33	1/5/15 @ 13:19	13066	-0.6	678GS	X			
WAA-04-RH-DU-20150105	6	12/27/14 @ 11:30	1/5/15 @ 13:43	13093	-0.6	679GS	X			
WAA-00-RH-TB-20150105	7	12/27/14 @ 10:42	1/5/15 @ 14:15	NA	NA	680GS	X			

Report Tier Levels - please select one

Tier I - (Results/Default if not specified) ____
Tier II (Results + QC) ____
Tier III (Data Validation Package) 10% Surcharge ____
Tier V (client specified) ____

EDD required **Yes**
Type: ____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Reliquished by: (Signature) Dave Kinroth	Date: 1-7-15	Time: 1508			Received by: (Signature)	Date:	Time:
Reliquished by: (Signature) FEDEX	Date:	Time:			Received by: (Signature)	Date: 1/8/15	Time: 1350
Reliquished by: (Signature)	Date:	Time:			Received by: (Signature)	Date:	Time:

Cooler / Blank Temperature 3 °C

ALS Environmental
Sample Acceptance Check Form

Client: Tetra Tech, Incorporated Work order: P1500074

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 1/8/15 Date opened: 1/8/15 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☐	☐	☐
2	Container(s) **supplied by ALS**?	☐	☐	☐
3	Did **sample containers** arrive in good condition?	☐	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☐	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☐	☐	☐
6	Was **sample volume** received adequate for analysis?	☐	☐	☐
7	Are samples within specified holding times?	☐	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☐
	Cooler Temperature: 3° C Blank Temperature: ° C			
9	Was a **blank tube** received?	☐	☐	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
	Were custody seals on outside of sample container?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☐
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☐
	Do they contain moisture?	☐	☐	☐
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☐
	Are dual bed badges separated and individually capped and intact?	☐	☐	☐

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1500074-001.01	Passive (Radiello H2S)					
P1500074-002.01	Passive (Radiello H2S)					
P1500074-003.01	Passive (Radiello H2S)					
P1500074-004.01	Passive (Radiello H2S)					
P1500074-005.01	Passive (Radiello H2S)					
P1500074-006.01	Passive (Radiello H2S)					
P1500074-007.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Tetra Tech, Incorporated**
Client Project ID: **West Lake Landfill / 103X9025140058** ALS Project ID: P1500074

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 1/5/15
Date Received: 1/8/15
Date Extracted: 1/21/15
Date Analyzed: 1/21/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling Time Minutes	Dilution Factor	Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
WAA-01-RH-PS-20150105	P1500074-001	13129	1.0	**340**	570	110	**0.53**	0.88	0.17	**J**
WAA-02-RH-PS-20150105	P1500074-002	13070	1.0	**240**	570	110	**0.37**	0.89	0.17	**J**
WAA-03-RH-PS-20150105	P1500074-003	13070	1.0	**350**	570	110	**0.55**	0.89	0.17	**J**
WAA-04-RH-PS-20150105	P1500074-004	13093	1.0	**390**	570	110	**0.60**	0.89	0.17	**J**
WAA-05-RH-PS-20150105	P1500074-005	13066	1.0	**350**	570	110	**0.55**	0.89	0.17	**J**
WAA-04-RH-DU-20150105	P1500074-006	13093	1.0	**400**	570	110	**0.62**	0.89	0.17	**J**
WAA-00-RH-TB-20150105	P1500074-007	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150121-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
NA = Not applicable.

HUG
13 March 2015

Client: **Tetra Tech, Incorporated**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **West Lake Landfill / 103X9025140058**

ALS Project ID: P1500074
ALS Sample ID: P150121-LCS, P150121-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 1/21/15
Volume(s) Analyzed: NA

Compound	Spike Amount LCS / DLCS µg/L	Result LCS µg/L	Result DLCS µg/L	% Recovery LCS	% Recovery DLCS	ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
Hydrogen Sulfide	500	536	538	107	108	73-129	1	5	

ALS Environmental

Hydrogen Sulfide (H_2S) in Air Bench Sheet

ALS AQL 110

page 1 of 2

Service Request#: P1500074 / P1500232 Prep Run #: 227759 Run #: 429943

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-0915140l	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0408140l @500x	500 ~~425~~ ug/L SR 1/21/15	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625140l	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric prepped prior to coloring step
Amino Sulfuric	524-1231140l	1/31/15	
radiello Tube	14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff
ug/L (ppb)	0	57.3	115	229	573	859	1145	
Abs. @ 665 nm	0.000	0.053	0.124	0.230	0.577	0.865	1.140	0.99932648 DECORRECTED → DE=1.05

Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H_2S ppbV** (Temp. Corrected)	Result ug/m^3*** (Temp. Corrected)
ICB	—	—	—	—	—	0.000	0.000	-2.19/<60 MRL MDL	<116		
ICV 500ug/L	—	—	—	—	—	0.508	0.508	507			101%
MB1	—	25°C	0.010	—	—	0.011	0.011	8.83 / <11.6	<110		
MB2	—	—	—	—	—	0.011	0.011	8.83 / <11.6	<110		
LCS 500ug/L	—	↓	↓	—	0.011	0.578	0.567	565.687 DECORR 536.196	5362		107%
DLCS ↓	—	↓	↓	—	0.011	0.580	0.569	567.690/538.195	5381		108%
P1500074-1.01	13129	-0.6°C	↓	—	0.011	0.049	0.038	35.872	340.019	0.38	0.53
-2.01	13070	↓	↓	—	0.011	0.038	0.027	24.855	235.593	0.26	0.37
-3.01	13070	↓	↓	—	0.011	0.050	0.039	36.874	349.512	0.39	0.55
-4.01	13093	↓	↓	—	0.011	0.054	0.043	40.880	387.486	0.43	0.60
-5.01	13066	↓	↓	—	0.011	0.050	0.039	36.874	349.512	0.39	0.55
-6.01	13093	↓	↓	—	0.011	0.055	0.044	41.881	396.979	0.44	0.62
CCV1 500ug/L	—	—	—	—	—	0.506	0.506	505			101%
CCB1	—	—	—	—	—	0.000	0.000	-2.19/<11.6			

{ 4% RPD JRA

*Concentration after blank subtraction (as applicable)

Comments: **H_2S in ppbV = ng H_2S / (0.096 ng/ppb · min) x time in minutes; ***ug/m^3 = ppbV H_2S x (34.09 MW of H_2S / 24.46 gas constant)

TEMP CORRECTION = $\left(\frac{K}{298}\right)^{3.8}$ APPLY TO QUIC SAMPLING RATE

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide EMD VF223 EXP. 8/22/19] up to 1L with DI] up to 10 mL desorb volume

Prepped By: SR Date: 1/21/15 @ 1400

Analyzed By: SR Date: 1/21/15 @ 1430

Reviewed By: MW Date: 1/22/15

RL = 570 ng

MDL = 110 ng

ALS Environmental

Hydrogen Sulfide (H_2S) in Air Bench Sheet

ALS AQL 110

page 2 of 2

Service Request#: ____________

Prep Run #: 227759 Run #: 429943

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-0915401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0408(401 @500x	~~425~~ ug/L 500 1/21/15	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625 1402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric prepped prior to coloring step
Amino Sulfuric	524-1231 1402	1/31/15	
radiello Tube	14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.99932648
Abs. @ 665 nm	0.000	0.053	0.124	0.230	0.577	0.865	1.140	

DE = 1.0

DECORRECTED → Temp. Corrected

Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H_2S ppbV**	Result ug/m³***
P1500074-7.01	Ø	NA	0.010	—	0.011	0.012	0.001	-1.18 / <11.6	<110		
P1500232-1.01	20155	-1.7°C		—	0.011	0.043	0.032	29.863	283.059	0.21	0.29
-2.01	20165			—	0.011	0.036	0.025	22.852	216.606	0.16	0.22
-3.01	20170			—	0.011	0.030	0.019	16.843	159.647	0.12	0.16
-4.01	20169			—	0.011	0.044	0.033	30.864	292.553	0.22	0.30
-5.01	20161			—	0.011	0.038	0.027	24.855	235.593	0.17	0.24
-6.01	20169			—	0.011	0.038	0.027	24.855	235.593	0.17	0.24
-7.01	Ø	NA		—	0.011	0.015	0.004	1.82 / <11.6	<110		
CCV2 500ug/L	—	—	—	—	—	0.504	0.504	503			101%
CCB2	—	—	—	—	—	0.000	0.000	-2.19 / <11.6			

JFLA

ICV/CCV Acceptance Criteria: 90 - 110%

LCS/DLCS Acceptance Criteria: 73 – 129%

RPD Acceptance Criteria: ≤ 5%

Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

*Concentration after blank subtraction (as applicable)

Comments: **H_2S in ppbV = ng H_2S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H_2S x (34.09 MW of H_2S / 24.46 gas constant)

TEMP CORRECTION = $\left(\frac{K}{298}\right)^{3.?}$ APPLY TO Q.R. SAMPLING RATE

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide EMD VF22B EXP: 8/22/16 up to 1L with DI] up to 10 mL desorb volume

Prepped By: [signature] Date: 1/21/15 @ 1400

Analyzed By: [signature] Date: 1/21/15 @ 1430

Reviewed By: [signature] Date: 1/22/15

3/18/14 524-03181401 500PPM NO2
Purchased
Ricca Chemical Company Cat No 5444.5-4
LOT# 2403762 120ml Amber glass
EXP: 9/2014

3/20/14 524-03201401 0.1N H_2SO_4
5.6 ml conc H_2SO_4 (EMD 49284; EXP: 11/20/14) ↑ 2L w/DI
EXP: 11/20/14

4/8/14 524-04081401 Methylene Blue 1% Soln
100ml Purchased 3125000 ug/L 2500000 (4/8/14)
Alfa Aesar LOT K20Z010
Stock# 42771
EXP: 4/8/15

4/8/14 524-04081402 0.1N H_2SO_4
5.6ml conc H_2SO_4 (EMD 49284; EXP: 11/20/14) ↑ 2L w/ DI H_2O
EXP: 11/20/14

4/22/14 524-04221401 1000PPM SO_3 Stock
0.1591g Na_2SO_3 (JT Baker LOT# A10627; EXP: 8/31/14)
↑ 100ml w/DI H_2O.
EXP: 5/6/14

Sol'n
1:1
DI H_2O

6/25/14 S24-06251401 1:1 H_2SO_4
250 ml Conc H_2SO_4 (EMD 49284; EXP: 11/20/14) +
250 ml DI H_2O
EXP: 11/20/14

etc
8/31/14

6/25/14 S24-06251402 Ferric Chloride Soln
100g $FeCl_3 \cdot 6H_2O$ (Mallinckrodt J13631;
EXP 9/25/15)
EXP: 6/25/15

Ion/Cov
; EXP 8/1/14

6/26/14 S24-06251403 Sulfanilamide Soln
5.00g Sulfanilamide (JT Baker Lot J32618; EXP 1/6/16
DISSOLVED IN 50 ml Conc HCl (EMP Lot # 49260;
EXP: 2/7/16) ↑ 500 ml w/ DI H_2O
EXP: 6/25/15

25ml plastic

6/25/14 S24-06251404 AMINE Soln
SLOWLY ADD 6.25 ml Conc H_2SO_4 (EMD 49284;
EXP: 11/20/14 TO 2.5 ml DI. Let Cool.
DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
diamine oxalat (ALDRICH MKBG8841V; EXP:
5/24/16) IN ABOVE ACID Soln then dilute
to 250 ml w/ 1:1 H_2SO_4 (S24-06251401;
EXP: 11/20/14).
EXP: 07 25 14

Soln
Conc
ml w/

9/8/14 SZ — S24-09081401 0.1 N H_2SO_4
5.6 ml conc H_2SO_4 (CMD 492854; exp: 11/20/14)
↑ 2L w/ DI H_2O
exp: 11/30/14

9/8/14 SZ — S24-09081402 1.0 N NaOH
8.0 g NaOH (CMD B0632529 12/15) ↑ 200ml
w/ DI H_2O
exp: 9/8/15

9/15/14 SZ — S24-09151401 H_2S ready-to-stock
purchased Sigma Aldrich
RAD171 100ml Amber GLASS
LOT # 1427301 CAT # RAD171
prepped 1:50 ⇒ 1.145 µg/ml sulfide
exp: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H_2S by the cartridge code RAD170.
Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml-1 sulfide ions.
This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg·ml^{-1} of $S^{=}$
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers.
Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

12/31/14 SR

524-123/1401 1:1 H_2SO_4
250ml DI + 250ml Conc H_2SO_4
(EMD 5474; Exp: 11/7/19). Let Cool
Exp: 12/31/15

12/31/14 SR

524-123/140 Amine Soln
slowly Add 6.25ml Conc H_2SO_4 (EMD
5474; Exp: 11/7/19) To 2.5ml DI. Let Co

Dissolve 1.6875g N,N-Dimethyl-1,4-phenylene diamine
Oxalate (Aldrich MKBQ8241V; Exp: 5/24/16)
in Above H2O Soln. Then Dilute To
250ml w/ 1:1 H_2SO_4 (524-123/1401; Exp:
Exp: ~~12/3~~ 1/31/15
SR-12/31/14

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	ALS Environmental (Simi Valley, California)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 13, 2015
Sample Delivery Group (SDG):	P1500645
Sample Numbers:	WAA-01-RH-PS-20150213, WAA-02-RH-PS-20150213, WAA-03-RH-PS-20150213, WAA-04-RH-PS-20150213, WAA-04-RH-DU-20150213, WAA-05-RH-PS-20150213, and WAA-00-RH-TB-20150213
Matrix / Number of Samples:	5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

13 March 2015

Certified by Harry Ellis, Chemist — Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1500645 included five (5) environmental air (Radiello™ adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

Hydrogen sulfide was not detected in any of the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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www.alsglobal.com

LABORATORY REPORT

March 6, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on February 17, 2015. For your reference, these analyses have been assigned our service request number P1500645.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

By Sue Anderson at 5:03 pm, Mar 06, 2015

Sue Anderson
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1500645

CASE NARRATIVE

The samples were received intact under chain of custody on February 17, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H_2S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	838341
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272014-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Service Request: P1500645
Project ID: West Lake Landfill / 103X9025140058

Date Received: 2/17/2015
Time Received: 13:30

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	CAS AQL 110 - H2S Air
WAA-01-RH-PS-20150213	P1500645-001	Air	2/13/2015	13:54	X
WAA-02-RH-PS-20150213	P1500645-002	Air	2/13/2015	13:03	X
WAA-03-RH-PS-20150213	P1500645-003	Air	2/13/2015	13:30	X
WAA-04-RH-PS-20150213	P1500645-004	Air	2/13/2015	13:42	X
WAA-05-RH-PS-20150213	P1500645-005	Air	2/13/2015	13:16	X
WAA-01-RH-DU-20150213	P1500645-006	Air	2/13/2015	13:54	X
WAA-00-RH-TB-20150213	P1500645-007	Air	2/13/2015	14:13	X

Radiello - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No. P1500645

Company Name & Address (Reporting Information)	Project Name	ALS Contact:
Tetra Tech **415 Oak Street,** **Kansas City, MO 64106**	**West Lake Landfill** Project Number **103X9025140058**	Sue Anderson

Project Manager	P.O. # / Credit Card / Billing Information
Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)	**PO 1111500** **Attn: Emily Fisher** **415 Oak Street, Kansas City, MO 64106**
Phone: **816-412-1775** Fax: **816-410-1748**	
Email Address for Result Reporting: **emily.fisher@tetratech.com**	**emily.fisher@tetratech.com**

Analysis: (e.g. NO_2, SO_2, O_3, VOCs, Aldehyde, Ammonia)

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number	Hydrogen Sulfide			Comments
WAA-01-RH-PS-20150213	1	2/4/15 @ 14:07	2/13/15 @ 13:54	12947	1.7	376ME	X			
WAA-02-RH-PS-20150213	2	2/4/15 @ 13:29	2/13/15 @ 13:03	12934	1.7	377ME	X			
WAA-03-RH-PS-20150213	3	2/4/15 @ 13:50	2/13/15 @ 13:30	12940	1.7	378ME	X			
WAA-04-RH-PS-20150213	4	2/4/15 @ 13:57	2/13/15 @ 13:42	12945	1.7	379ME	X			
WAA-05-RH-PS-20150213	5	2/4/15 @ 13:37	2/13/15 @ 13:16	12939	1.7	380ME	X			
WAA-01-RH-DU-20150213	6	2/4/15 @ 14:07	2/13/15 @ 13:54	12947	1.7	381ME	X			
WAA-00-RH-TB-20150213	7	2/4/15 @ 14:14	2/13/15 @ 14:13	NA	NA	382ME	X			

Report Tier Levels - please select one
Tier I - (Results/Default if not specified) ____
Tier II (Results + QC) ____
Tier III (Data Validation Package) 10% Surcharge ____
Tier V (client specified) ____
EDD required **Yes**
Type: ____
Chain of Custody Seak (Circle) INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Reliquished by: (Signature)	Date:	Time:			Received by: (Signature)	Date:	Time:
Trinity Baldwin	2-16-15	1315			FED EX		
Reliquished by: (Signature)	Date:	Time:			Received by: (Signature)	Date:	Time:
FED EX						2/17/15	1330
Reliquished by: (Signature)	Date:	Time:			Received by: (Signature)	Date:	Time:

Cooler / Blank Temperature 28 °C

9.6.18

ALS Environmental
Sample Acceptance Check Form

Client: Tetra Tech, Incorporated Work order: P1500645

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 2/17/15 Date opened: 2/17/15 by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☐	☐	☐
2	Container(s) **supplied by ALS**?	☐	☐	☐
3	Did **sample containers** arrive in good condition?	☐	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☐	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☐	☐	☐
6	Was **sample volume** received adequate for analysis?	☐	☐	☐
7	Are samples within specified holding times?	☐	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☐
	Cooler Temperature: 28° C Blank Temperature: ° C			
9	Was a **blank tube** received?	☐	☐	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
	Were custody seals on outside of sample container?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☐
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☐
	Do they contain moisture?	☐	☐	☐
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☐
	Are dual bed badges separated and individually capped and intact?	☐	☐	☐

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1500645-001.01	Passive (Radiello H2S)					
P1500645-002.01	Passive (Radiello H2S)					
P1500645-003.01	Passive (Radiello H2S)					
P1500645-004.01	Passive (Radiello H2S)					
P1500645-005.01	Passive (Radiello H2S)					
P1500645-006.01	Passive (Radiello H2S)					
P1500645-007.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Tetra Tech, Incorporated**
Client Project ID: **West Lake Landfill / 103X9025140058**
ALS Project ID: P1500645

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 2/13/15
Date Received: 2/17/15
Date Extracted: 2/26/15
Date Analyzed: 2/26/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling Time Minutes	Dilution Factor	Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
WAA-01-RH-PS-20150213	P1500645-001	12947	1.0	ND	570	110	ND	0.87	0.17	
WAA-02-RH-PS-20150213	P1500645-002	12934	1.0	ND	570	110	ND	0.87	0.17	
WAA-03-RH-PS-20150213	P1500645-003	12940	1.0	ND	570	110	ND	0.87	0.17	
WAA-04-RH-PS-20150213	P1500645-004	12945	1.0	ND	570	110	ND	0.87	0.17	
WAA-05-RH-PS-20150213	P1500645-005	12939	1.0	ND	570	110	ND	0.87	0.17	
WAA-01-RH-DU-20150213	P1500645-006	12947	1.0	ND	570	110	ND	0.87	0.17	
WAA-00-RH-TB-20150213	P1500645-007	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150226-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
NA = Not applicable.

HVE
13 March 2015

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Tetra Tech, Incorporated**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **West Lake Landfill / 103X9025140058**

ALS Project ID: P1500645
ALS Sample ID: P150226-LCS, P150226-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 2/26/15
Volume(s) Analyzed: NA

Compound	Spike Amount LCS / DLCS µg/L	Result LCS µg/L	Result DLCS µg/L	% Recovery LCS	% Recovery DLCS	ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
Hydrogen Sulfide	500	535	530	107	106	73-129	1	5	

ALS Environmental

Hydrogen Sulfide (H_2S) in Air Bench Sheet
AQL 110

Service Request#: P1500645 P1500733 Prep Run #: 230441 Run #: 434798

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-09152401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-04081401 @5000	~~500~~ 425 ug/L 2/26/15	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-06251402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric prepped prior to coloring step
Amino Sulfuric	524-02101502	3/10/15	
radiello Tube	14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.99989296
Abs. @ 665 nm	0.000	0.055	0.124	0.246	0.581	0.868	1.148	DE CORRECTED → DE=1.055

Temp. Corrected

Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb) MDL	Result ng/sample	Result H_2S ppbV**	Result ug/m^3***
ICB	—	—	—	—	~~0.000~~	0.000	-5.53/<11.6				
ICV 500ug/L	—	—	—	—	~~0.500~~	0.500	494				99%
MB1	—	25°C	0.010	—	—	0.011	0.011	5.45/<11.6	<110		
MB2	—	↓		—	—	0.011	0.011	5.45/<11.6	<110		
LCS 500ug/L	—			—	0.011	0.582	0.571	564.53 539.10	5391		107%
DLCS ↓	—	↓		—	0.011	0.577	0.566	559.51 530.36	5303		106%
P1500645-1.01	12947	1.7°C		—	0.011	0.028	0.017	11.4/<11.6	<110	<0.13	<0.17
-2.01	12934			—	0.011	0.021	0.010	4.45/<11.6	<110	<0.13	<0.17
-3.01	12940			—	0.011	0.025	0.014	8.45/<11.6	<110	<0.13	<0.17
-4.01	12945			—	0.011	0.028	0.017	11.4/<11.6	<110	<0.13	<0.17
-5.01	12939			—	0.011	0.020	0.009	3.46/<11.6	<110	<0.13	<0.17
-6.01	12947	↓	↓	—	0.011	0.020	0.009	3.46/<11.6	<110	<0.13	<0.17
CCV1 500ug/L	—	—	—	—	—	0.497	0.497	491			98%
CCB1	—	—	—	—	—	0.000	0.000	-5.53/<11.6			

<21% RPD

*Concentration after blank subtraction (as applicable)

Comments: **H_2S in ppbV = ng H_2S / (0.096 ng/ppb · min) x time in minutes; ***ug/m^3 = ppbV H_2S x (34.09 MW of H_2S / 24.46 gas constant)

TEMP CORRECTION = $\left(\frac{K}{298}\right)^{2.8}$ Apply to Q_K sampling rate

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide (OMD VE22B Exp: 8/02/16) up to 1L with DI] up to 10 mL desorb volume

Prepped By: [signature] Date: 2/26/15 @ 1200

Analyzed By: [signature] Date: 2/26/15 @ 1230

Reviewed By: [signature] Date: 3/3/15

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ALS Environmental

Hydrogen Sulfide (H_2S) in Air Bench Sheet

AQL 110

Service Request#: PIS00645 PS00733

Prep Run #: 230441

Run #: 434798

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-09151401	57250 ug/L	9/21/15
Sulfide ICV/CCV	524-0408/401	500 ~~425~~ ug/L @5000x	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-06251402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric prepped prior to coloring step
Amino Sulfuric	524-02101502	3/10/15	
radiello Tube	143/5	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.999892976
Abs. @ 665 nm	0.000	0.055	0.124	0.246	0.581	0.868	1.148	

DE = 1.05 J

Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Temp. Corrected Result H_2S ppbV**	Temp. Corrected Result ug/m³***
PIS00645-7.01	0	—	0.010	—	0.011	0.012	0.001	-4.53/41.6	4110		
PIS00733-1.01	10026	-7.2°C			0.011	0.018	0.007	1.46/41.6	4110	20.18	20.25
-2.01	10024				0.011	0.035	0.024	18.431	174.706	0.28	0.39 (J)
-3.01	10022				0.011	0.023	0.012	6.45/41.6	410	20.18	20.25
-4.01	10028				0.011	0.019	0.008	2.46/41.6		20.18	20.25
-5.01	10024				0.011	0.017	0.006	0.46/41.6		20.18	20.25
-6.01	10028				0.011	0.018	0.007	1.46/41.6		20.18	20.25
-7.01	0	—		—	0.011	0.012	0.001	-4.53/41.6			
CCV2	—	—	—	—	—	0.495	0.495	489			984.0
CCB2	—	—	—	—	—	0.000	0.000	-5.53/41.6			

— ICV/CCV Acceptance Criteria: 90 -110%

— LCS/DLCS Acceptance Criteria: 73 – 129%

— RPD Acceptance Criteria: ≤ 5%

— Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

*Concentration after blank subtraction (as applicable)

Comments: **H_2S in ppbV = ng H_2S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H_2S x (34.09 MW of H_2S / 24.46 gas constant)

TEMP CORRECTION = $(\frac{K}{298})^3$

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide_____ up to 1L with DI] up to 10 mL desorb volume

Prepped By: [signature] Date: 2/26/15 @1420

Analyzed By: [signature] Date: 2/26/15 @1630

Reviewed By: [signature] Date: 3/3/15

APPLY TO QC SAMPLING DATES

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14 of 18

524-0318/401 500PPM NO2

3/18/14 Purchased
Ricca Chemical Company Cat No 5444.5-4
Lot # 2403760 120ml Amber glass
Exp: 9/2014

3/20/14 524-0320/401 0.1N H2SO4
5.6 ml conc H2SO4 (EMD 4928-4; Exp: 11/20/14) ↑ 2L w/ DI
Exp: 11/20/14

4/8/14 524-0408/401 Methylene Blue 2% Sol'y
100ml Purchased Sol'y 4/8/14 2125000 US/L 2500000
Alfa Aesar Lot K20G010
Stock # 4277
Exp: 4/8/15

4/8/14 524-0408/402 0.1N H2SO4
5.6ml conc H2SO4 (EMD 4928-4; Exp: 11/20/14) ↑ 2L w/ DI H2O
Exp: 11/20/14

4/22/14 524-0422/401 100ppm SO3 Stock
0.1591g Na2SO3 (JT Baker Lot # H10627; Exp: 8/31)
↑ 100ml w/ DI H2O.
Exp: 5/6/14

6/25/14 S24-06251401 1:1 H_2SO_4
250 ml Conc H_2SO_4 (EMD 49284; EXP: 11/20/14) + 250 ml DI H_2O
EXP: 11/20/14

6/25/14 S24-06251402 Ferric Chloride Soln
100g $FeCl_3 \cdot 6H_2O$ (Mallinckrodt J13631; EXP: 9/25/15)
EXP: 6/25/15

6/26/14 S24-06251403 Sulfanilamide Sol
5.00g Sulfanilamide (JT Baker LOT J32618; EXP 1/6/1...
DISSOLVED IN 50 ml Conc HCl (EMP LOT # 49260; EXP: 2/7/16) ↑500 ml w/ DI H_2O
EXP: 6/25/15

6/25/14 S24-06251404 AMINE Soln
SLOWLY ADD 6.25 ml Conc H_2SO_4 (EMD 49284; EXP: 11/20/14 TO 2.5 ml DI-Water.
DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene diamine oxalat (ALDRICH MKBS7894V; EXP: 5/24/16) IN ABOVE ACID Soln then dilute to 250 ml w/ 1:1 H_2SO_4 (S24-06251401; EXP: 11/20/14).
EXP: 07 25 14

9/8/14 S24-0908140I 0.1 N H_2SO_4
SR 5.6 ml Conc. H_2SO_4 (EMD 49284; EXP: 11/20/14)
↑ 2L w/ DI H_2O
EXP: 11/20/14

9/8/14 S24-0908140Z 1.0 N NaOH
SR 8.0g NaOH (EMD B0630369 121B) ↑ 200ml
w/ DI H_2O
EXP: 9/8/15

9/15/14 S24-0915140I H_2S radiello stock
SR purchased Sigma Aldrich
RAD 171 100 ml Amber Glass
LOT # 1427902 CAT # RAD 171
Prepped 1:50 ⇒ 1.145 ug/ml Sulfide
EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description
Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H_2S by the cartridge code RAD170.
Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml-1 sulfide ions.
This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to $\mu g \cdot ml^{-1}$ of $S^{=}$
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage
Store in original containers or other appropriately labeled, suitable containers.
Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

S24-0204150I 0.1N H2SO4

2/4/15 5.6 ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19
QL ↑ 2L w/ DI H_2O
EXP: 2/4/16

2/4/15 S24-0204150I 1000 PPM NH_3 Stock
QL 0.3141g NH_4Cl (EMD WJ11C; EXP: 6/5/19)
↑ 100ml w/ S24-0204150I.
EXP: 8/4/15

2/5/15 S24-0205150I 0.1 N H_2SO_4
QL 5.6ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)
↑ 2L w/ DI H_2O
EXP: 2/5/16

2/10/15 S24-0210150I 1:1 H_2SO_4
QL 250 ml DI + 250ml Conc H_2SO_4
(EMD 54174; EXP: 11/7/19.) Let Cool
EXP: 2/10/16

2/10/15 S24-0210150I AMINE Sol'n
SLOWLY ADD 6.25ml Conc H_2SO_4 (EMD 54174;
EXP: 11/7/19) to 2.5 ml DI H_2O. Let Cool
Dissolve 1.6875g N,N-Dimethyl-1,4-phenylenediamine oxalate
(Aldrich MKBX8SYW; EXP: 5/24/16) IN ABOVE ACID SOLN. THEN
Dilute TO 250ml W/ 1:1 H_2SO_4 (S24-0210150I; 2/10/16)
EXP: ~~2/10/16~~ 3/10/15
QL 2/27/15 INCORRECT EXP performed

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	West Lake Landfill Site, Bridgeton, Missouri
Laboratory:	ALS Environmental (Simi Valley, California)
Data Reviewer:	Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date	March 13, 2015
Sample Delivery Group (SDG):	P1500733
Sample Numbers:	WAA-01-RH-PS-20150220, WAA-02-RH-PS-20150220, WAA-03-RH-PS-20150220, WAA-04-RH-PS-20150220, WAA-04-RH-DU-20150220, WAA-05-RH-PS-20150220, and WAA-00-RH-TB-20150220
Matrix / Number of Samples:	5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.

Harry N. Ellis III

13 March 2015

Certified by Harry Ellis, Chemist — Date

DATA VALIDATION QUALIFIERS

U — The analyte was not detected above the reported sample quantitation limit.

J — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ — The analyte was not detected above the reported sample quantitation limit, which is estimated.

R — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1500733 included five (5) environmental air (Radiello™ adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

The only detected result in the field samples was less than the sample reporting limits, which correspond to the lowest calibration standard. The laboratory correctly qualified this result as estimated and flagged it "J".

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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www.alsglobal.com

LABORATORY REPORT

March 6, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on February 24, 2015. For your reference, these analyses have been assigned our service request number P1500733.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

By Sue Anderson at 5:07 pm, Mar 06, 2015

Sue Anderson
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
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F: +1 805 526 7270
www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1500733

CASE NARRATIVE

The samples were received intact under chain of custody on February 24, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H_2S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	838341
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-001
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272014-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Service Request: P1500733
Project ID: West Lake Landfill / 103X9025140058

Date Received: 2/24/2015
Time Received: 16:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	CAS AQL 110 - H2S Air
WAA-01-RH-PS-20150220	P1500733-001	Air	2/20/2015	13:00	X
WAA-02-RH-PS-20150220	P1500733-002	Air	2/20/2015	12:07	X
WAA-03-RH-PS-20150220	P1500733-003	Air	2/20/2015	12:32	X
WAA-04-RH-PS-20150220	P1500733-004	Air	2/20/2015	12:50	X
WAA-05-RH-PS-20150220	P1500733-005	Air	2/20/2015	12:20	X
WAA-04-RH-DU-20150220	P1500733-006	Air	2/20/2015	12:50	X
WAA-00-RH-TB-20150220	P1500733-007	Air	2/20/2015	13:10	X

Radiello - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No. P1500733

Company Name & Address (Reporting Information)
Tetra Tech
415 Oak Street,
Kansas City, MO 64106

Project Name
West Lake Landfill

Project Number
103X9025140058

ALS Contact:
Sue Anderson

Project Manager
Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)

Phone
816-412-1775

Fax
816-410-1748

Email Address for Result Reporting
emily.fisher@tetratech.com

P.O. # / Credit Card / Billing Information
PO 1111500
Attn: Emily Fisher
415 Oak Street, Kansas City, MO 64106
emily.fisher@tetratech.com

Analysis:
(e.g. NO_2, SO_2, O_3, VOCs, Aldehyde, Ammonia)

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number	Hydrogen Sulfide			Comments
WAA-01-RH-PS-20150220		2/13/15 @ 13:54	2/20/15 @ 13:00	10026	-7.2	197MH	X			
WAA-02-RH-PS-20150220		2/13/15 @ 13:03	2/20/15 @ 12:07	10024	-7.2	198MH	X			
WAA-03-RH-PS-20150220		2/13/15 @ 13:30	2/20/15 @ 12:32	10022	-7.2	196MH	X			
WAA-04-RH-PS-20150220		2/13/15 @ 13:42	2/20/15 @ 12:50	10028	-7.2	199MH	X			
WAA-05-RH-PS-20150220		2/13/15 @ 13:16	2/20/15 @ 12:20	10024	-7.2	194MH	X			
WAA-04-RH-DU-20150220		2/13/15 @ 13:42	2/20/15 @ 12:50	10028	-7.2	195MH	X			
WAA-00-RH-TB-20150220		2/13/15 @ 12:54	2/20/15 @ 13:10	NA	NA	193MH	X			

Report Tier Levels - please select one
Tier I - (Results/Default if not specified) ____
Tier II (Results + QC) ____
Tier III (Data Validation Package) 10% Surcharge ____
Tier V (client specified) ____

EDD required **Yes**
Type: ____

Chain of Custody Seals (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature) Tully Boulieau	Date: 2/23/15	Time: 1400			Received by: (Signature) FED EX	Date:	Time:	
Relinquished by: (Signature) FED EX	Date:	Time:			Received by: (Signature)	Date: 2/24/15	Time: 1615	ice
Relinquished by: (Signature)	Date:	Time:			Received by: (Signature)	Date:	Time:	Cooler / Blank Temperature ____ °C

ALS Environmental
Sample Acceptance Check Form

Client: Tetra Tech, Incorporated Work order: P1500733

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 2/24/15 Date opened: 2/24/15 by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☐	☐	☐
2	Container(s) **supplied by ALS**?	☐	☐	☐
3	Did **sample containers** arrive in good condition?	☐	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☐	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☐	☐	☐
6	Was **sample volume** received adequate for analysis?	☐	☐	☐
7	Are samples within specified holding times?	☐	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☐
9	Was a **trip blank** received?	☐	☐	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
	Were custody seals on outside of sample container?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☐
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☐
	Do they contain moisture?	☐	☐	☐
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☐
	Are dual bed badges separated and individually capped and intact?	☐	☐	☐

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1500733-001.01	Passive (Radiello H2S)					
P1500733-002.01	Passive (Radiello H2S)					
P1500733-003.01	Passive (Radiello H2S)					
P1500733-004.01	Passive (Radiello H2S)					
P1500733-005.01	Passive (Radiello H2S)					
P1500733-006.01	Passive (Radiello H2S)					
P1500733-007.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Tetra Tech, Incorporated**
Client Project ID: **West Lake Landfill / 103X9025140058**

ALS Project ID: P1500733

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 2/20/15
Date Received: 2/24/15
Date Extracted: 2/26/15
Date Analyzed: 2/26/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling Time Minutes	Dilution Factor	**Result ng/Sample**	MRL ng/Sample	MDL ng/Sample	**Result µg/m³**	MRL µg/m³	MDL µg/m³	Data Qualifier
WAA-01-RH-PS-20150220	P1500733-001	10026	1.0	ND	570	110	ND	1.3	0.25	
WAA-02-RH-PS-20150220	P1500733-002	10024	1.0	**170**	570	110	**0.39**	1.3	0.25	J
WAA-03-RH-PS-20150220	P1500733-003	10022	1.0	ND	570	110	ND	1.3	0.25	
WAA-04-RH-PS-20150220	P1500733-004	10028	1.0	ND	570	110	ND	1.3	0.25	
WAA-05-RH-PS-20150220	P1500733-005	10024	1.0	ND	570	110	ND	1.3	0.25	
WAA-04-RH-DU-20150220	P1500733-006	10028	1.0	ND	570	110	ND	1.3	0.25	
WAA-00-RH-TB-20150220	P1500733-007	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150226-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
NA = Not applicable.

HVG
13 March 2015

Client: **Tetra Tech, Incorporated**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **West Lake Landfill / 103X9025140058**

ALS Project ID: P1500733
ALS Sample ID: P150226-LCS, P150226-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 2/26/15
Volume(s) Analyzed: NA

Compound	Spike Amount LCS / DLCS µg/L	Result LCS µg/L	Result DLCS µg/L	% Recovery LCS	% Recovery DLCS	ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
Hydrogen Sulfide	500	535	530	107	106	73-129	1	5	

ALS Environmental

Hydrogen Sulfide (H_2S) in Air Bench Sheet

AQL 110

Service Request#: P1500645 R500733

Prep Run #: 230441

Run #: 434758

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-0915401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0408/1401 @5260	~~5260~~ 5425 ug/L @ 3/26/15	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625/1402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric prepped prior to coloring step
Amino Sulfuric	524-0210/1502	3/10/15	
radiello Tube	14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.999892976
Abs. @ 665 nm	0.000	0.055	0.124	0.246	0.581	0.868	1.148	DE-1.055
								~~DECORRECTED~~ → Temp. Corrected

Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.* MDL	Result ug/L (ppb)	Result ng/sample	Result H_2S ppbV**	Result ug/m³***
ICB	—	—	—	—	0.000	0.000	-5.53 / 11.6				
ICV 500 ug/L	—	—	—	—	0.500	0.500	484				99%
MB1	—	25°C	0.010	—	—	0.011	0.011	5.45 / 11.6	<110		
MB2 & LCS 500 ug/L	—	↓	↓	—	0.011	0.582	0.571	564.53 (DE corr) 539.10	5351		107%
DLCS ↓	—	↓	↓	—	0.011	0.577	0.566	559.51 (DE corr) 530.36	5303		106%
P1500645-1.01	12947	1.7°C		—	0.011	0.028	0.017	11.4 / 11.6	<110	<0.13	<0.17
2.01	12934			—	0.011	0.021	0.010	4.45 / 11.6	<110	<0.13	<0.17
-3.01	12940			—	0.011	0.025	0.014	8.45 / 11.6	<110	<0.13	<0.17
-4.01	12945			—	0.011	0.028	0.017	11.4 / 11.6	<110	<0.13	<0.17
-5.01	12939			—	0.011	0.020	0.009	3.46 / 11.6	<110	<0.13	<0.17
-6.01	12947	↓	↓	—	0.011	0.020	0.009	3.46 / 11.6	<110	<0.13	<0.17
CCV 500 ug/L	—	—	—	—	—	0.497	0.497	491			98%
CCB1	—	—	—	—	—	0.000	0.000	-5.53 / 11.6			

*Concentration after blank subtraction (as applicable)

Comments: **H_2S in ppbV = ng H_2S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H_2S x (34.09 MW of H_2S / 24.46 gas constant)

TEMP CORRECTION = $\left(\frac{K}{298}\right)^{3.8}$

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide AMD VE225 Exp. 5/22/16 up to 1L with DI] up to 10 mL desorb volume

APPLY TO Qk SAMPLING RATE

Prepped By: [signature] Date: 2/26/15 @ 1200

Analyzed By: [signature] Date: 2/26/15 @ 1230

Reviewed By: [signature] Date: 3/3/15

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ALS Environmental

Hydrogen Sulfide (H_2S) in Air Bench Sheet

AQL 110

page 2 of 2

Service Request#: P1500645 P1500733

Prep Run #: 230441

Run #: 434798

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-09151401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-04081401 @5000x	500 ~~425~~ ug/L SA 2/20/15	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-06251402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric prepped prior to coloring step
Amino Sulfuric	524-02101502	3/10/15	
radiello Tube	143115	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.999892976
Abs. @ 665 nm	0.000	0.055	0.124	0.246	0.581	0.868	1.148	DF=1,055

Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Temp. Corrected Result H_2S ppbV**	Temp. Corrected Result ug/m³***
P1500645-7.01	Ø	—	0.010	—	0.011	0.012	0.001	-4.53/41.6	L10		
P1500733-1.01	10026	-7.2°C	—	—	0.011	0.018	0.007	1.46/41.6	L10	L0.18	L0.25
-2.01	10024	—	—	—	0.011	0.035	0.024	18.43/	174.706	0.28	0.39 (J)
-3.01	10022	—	—	—	0.011	0.023	0.012	6.45/41.6	L10	L0.18	L0.25
-4.01	10028	—	—	—	0.011	0.019	0.008	2.46/41.6		L0.18	L0.25
-5.01	10024	—	—	—	0.011	0.017	0.006	0.46/41.6		L0.18	L0.25
-6.01	10028	—	—	—	0.011	0.018	0.007	1.46/41.6		L0.18	L0.25
-7.01	Ø	—	—	—	0.011	0.012	0.001	-4.53/41.6			
LCS2	—	—	—	—	—	0.495	0.495	484			984
LCS2	—	—	—	—	—	0.000	0.000	-5.53/41.6			

— ICV/CCV Acceptance Criteria: 90 -110%

— LCS/DLCS Acceptance Criteria: 73 – 129%

— RPD Acceptance Criteria: ≤ 5%

Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

*Concentration after blank subtraction (as applicable)

Comments: **H_2S in ppbV = ng H_2S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H_2S x (34.09 MW of H_2S / 24.46 gas constant)

TEMP CORRECTION $= \left(\frac{K}{298}\right)^3$

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide ____ up to 1L with DI] up to 10 mL desorb volume

APPLY TO QC SAMPLING DATE

Prepped By: [signature] Date: 2/26/15 @1330

Analyzed By: [signature] Date: 2/26/15 @1330

Reviewed By: [signature] Date: 3/3/15

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3/18/14 — 524-03181401 500PPM NO2
Purchased
Ricca Chemical Company Cat No 5444.5-4
LOT# 2403760 120ml Amber Glass
EXP: 9/2014

3/20/14 — 524-03201401 0.1 N H_2SO_4
5.6 ml Conc H_2SO_4 (EMD 49284; EXP: 11/20/14) ↑ 2L w/ DI
EXP: 11/20/14

4/8/14 — 524-04081401 Methylene Blue 2% Sol
100 ml purchased
Alfa Aesar LOT K20B010
Stock# 42771
EXP: 4/8/15

4/8/14 — 524-04081402 0.1 N H_2SO_4
~~5.6 ml Conc~~ H_2SO_4 (EMD 49284; EXP: 11/20/14) ↑ 2L w/ DI H_2O
EXP: 11/20/14

4/22/14 — 524-04221401 1000PPM SO_3 Stock
0.1591g Na_2SO_3 (JT Baker LOT# A10627; EXP: 8/31)
↑ 100ml w/ DI H_2O.
EXP: 5/6/14

6/25/14 SZ4-06251401 1:1 H_2SO_4
250ml Conc H_2SO_4 (EMD 49284; EXP: 11/20/14) +
250 ml DI H_2O
EXP: 11/20/14

6/25/14 SZ4-06251402 Ferric Chloride Soln
100g $FeCl_3 \cdot 6H_2O$ (Mallinckrodt JT3631;
EXP 9/25/15)
EXP: 6/25/15

6/26/14 SZ4-06251403 Sulfanilamide Soln
5.00g Sulfanilamide (JT Baker LOT J32618; EXP 1/61
DISSOLVED IN 50ml Conc HCl (EMP LOT # 49260;
EXP: 2/7/16) ↑ 500ml w/ DI H_2O
EXP: 6/25/15

6/25/14 SZ4-06251404 AMINE Soln
SLOWLY ADD 6.25ml Conc H_2SO_4 (EMD 49284;
EXP: 11/20/14 TO 2.5ml DI. let cool.
DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
diamine oxalate (ALDRICH MC15278LV; EXP:
5/24/16) IN ABOVE ACID Soln then dilute
to 250 ml w/ 1:1 H_2SO_4 (SZ4-06251401;
EXP: 11/20/14).
EXP: 07/25/14

9/8/14 SZ — S24-0908140I 0.1 N H_2SO_4
5.6 ml Conc. H_2SO_4 (EMD 49284; EXP: 11/20/14)
↑ 2L w/ DI H_2O
EXP: 11/20/14

9/8/14 SZ — S24-0908140Z 1.0 N NaOH
8.0g NaOH (EMD B0630369 121B) ↑ 200ml
w/ DI H_2O
EXP: 9/8/15

9/15/14 SZ — S24-0915140I H_2S radiello stock
Purchased Sigma Aldrich
RAD 171 100 ml Amber Glass
LOT # 1427902 CAT # RAD 171
Prepped 1:50 ⇒ 1.145 ug/ml Sulfide
EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H_2S by the cartridge code RAD170.
Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml-1 sulfide ions.
This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg·ml^{-1} of $S^{=}$
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers.
Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

S24-0204150I 0.1N H2SO4

2/4/15 5.6 ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19
QL ↑ 2L w/ DI H_2O
EXP: 2/4/16

2/4/15 S24-0204150I 1000 PPM NH_3 Stock
QL 0.3141g NH_4Cl (EMD WJ11C; EXP: 6/5/19)
↑ 100ml w/ S24-0204150I.
EXP: 8/4/15

2/5/15 S24-0205150I 0.1 N H_2SO_4
QL 5.6ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)
↑ 2L w/ DI H_2O
EXP: 2/5/16

2/10/15 S24-0210150I 1:1 H_2SO_4
QL 250 ml DI + 250ml Conc H_2SO_4
(EMD 54174; EXP: 11/7/19.) Let Cool
EXP: 2/10/16

2/10/15 S24-0210150I AMINE Sol'n
SLOWLY ADD 6.25ml Conc H_2SO_4 (EMD 54174;
EXP: 11/7/19) to 2.5 ml DI H_2O. Let Cool
Dissolve 1.6875g N,N-Dimethyl-1,4-phenylenediamine oxalate
(Aldrich MKBX8294V; EXP: 5/24/16) IN ABOVE ACID SOLN. THEN
Dilute TO 250ml W/ 1:1 H_2SO_4 (S24-0210150I; 2/10/16)
EXP: ~~2/10/16~~ 3/10/15
QL 2/27/15 INCORRECT EXP performed